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Accounting for the Right to Water: The Great Artesian Basin and Olympic Dam Mine

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CERTIFICATION

I, Yanwen Shao, certify that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy in the School of Accounting and Finance at the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

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ABSTRACT

Water is a scarce resource in Australia, therefore the significant use of groundwater from the Great Artesian Basin by the mining industry is inevitably controversial. This thesis examines one such water dispute that emanated from BHP Billiton Olympic Dam Corporation Pty Ltd's (BHP OD) expansion and the associated water related risks. Therefore, it is concerned with the politicised control of the Australia's largest groundwater resource arising from the Australia's largest multi-mineral mine against the broad backdrop of water scarcity. In particular, the thesis highlights the culturally constructed meanings of risk in a contested domain of accounting and accountability.

In order to frame competing water risk perspectives from different institutions - industry, government and civil society - into a communicative effort for enhanced public participation and engagement, this thesis adopts a critical cultural risk perspective combined with Burkean rhetorical criticism to analyse mandatory and voluntary water accounting disclosures and policy debates from BHP, BHP OD, and its representative, the Minerals Council of Australia (MCA); GAB water regulatory policy documents and proposals from the South Australian government and Australian Federal government; and, alternative disclosures from civil society, including non-government organisations (NGOs), (radical) environmentalists and Aboriginal groups.

Since discourse is considered as a mode of institutional and political practice, and rhetoric is the technique of using discourse for persuasive effects, a Burkean rhetorical criticism (Stillar, 1998) combined with Douglas and Wildavsky's (1982) cultural risk theory allows a critical exploration of the underlying assumptions of contentious water related disclosures. Further, it implicates accountability discourses and their role in incorporating economic, social and environmental accountability into a transdisciplinary dialogue to risk-based sustainability. Nine major sustainability-related concepts including; preferred learning style, view of nature, properties of knowledge ideal, attitude towards technology, view of risk, resolution of risk, cause of ecological crisis, view of justice and fairness and properties of desired system are revealed. These concepts map to three accounting related concepts/themes of the concept of control, stewardship and economic consequences. Three different styles of accountability - managerial, administrative and moral accountability inform the unavoidable conflicts between capitalist system advocated and sustained by market (industry) and hierarchy

(government) institutions, and a radical agenda proposed and warranted by border (civil society) institutions.

This thesis makes unique methodological and theoretical contributions by adopting a discursive and dialogical accounting approach and a 'transdisciplinary' cultural risk theory to allow social and environmental visibilities, promote democratic participation, enhance transparency in decision-making and improve accountability in a 'polylogic' society during the era of impending environmental crisis (Brown, 2009; Gray, 1992). This study was conducted at a meso-level of analysis and therefore does not address all the complexity and anomalies of pluralist and competing interests involved in the GAB water debate. In respect of future research, this methodology and theoretical development can be applied to other political debates such as those from GAB Strategic Management Plan more broadly and other specific dialogues concerning water, for example, coal seam gas mining in the Murry Darling Basin more specifically.

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"God, grant me the serenity to accept the things I cannot change, the courage to change the things I can change, and the wisdom to know the difference"

(Reinhold Niebuhr)

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GLOSSARY AND ABBREVIATIONS

ACCC	Australian Competition and Consumer Commission
BHP	BHP Billiton
BHP OD	BHP Billiton Olympic Dam Corporation Pty Ltd
BPT	Best Practicable Technology
BSC	Balance Scorecard
CDP	Carbon Disclosure Project
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DNR	Queensland Department of Natural Resource
EMMR	Environmental Management and Monitoring Report
EMP	Environmental Management Program
FASB	Financial Accounting Standards Board
GAB	Great Artesian Basin
GABCC	Great Artesian Basin Coordinating Committee
GEMI	Global Environmental Management Initiative
GL	Giga-litre
IASB	International Accounting Standard Broad
ICMM	International Council on Mining and Metals
KL	Kilolitre
LCA	Life Cycle Assessment
MCA	Minerals Council of Australia
ML	Million litre or Mega-litre
MM	Millimetre
NGO	Non-Government Organisation
NNW	North-Northwest
NRM	Natural Resource Management
NRMMC	National Resource Management Ministerial Council
NWI	National Water Initiative
ODEP	Olympic Dam Expansion Project

ORS	Online Response System
PIMS	Production Information Management System
PIRSA	South Australian Department of Primary Industry and Resources
SAALNRM	South Australian Arid Lands Natural Resources Management (Board)
SEAR	Social & Environmental Accounting & Reporting
(S)EIS	(Supplementary) Environmental Impact Statement
WAP	Water Allocation Plan
WBCSD	World Business Council for Sustainable Development
WMC	Western Mining Corporation
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNEP	United Nations Environment Programme
UN-FAO	Food and Agriculture Organisation of the United Nations

CHAPTER 1 INTRODUCTION

Water is an essential natural resource for life. It is pivotal in sustaining human health, economic development, as well as environmental and ecological stability (Morrison, Schulte & Schenck, 2010; United Nations, 2006). In recent decades, increasing water scarcity, a growing demand for water, and degraded water quality have become a challenge to human beings and ecosystems at regional, national and international level (Morrison et al., 2010).

Historically, in Australia, controversies and debates have arisen around water scarcity and control (James, Dowd, Rodriguez & Jeanneret, 2012). Due to a significant variability of rainfall, Australia faces a range of issues resulting from drought because of high evaporation rates and a low proportion of runoff (Prosser, 2011). Fully-allocated and over-allocated use of river and underground water systems compound the problem (Prosser, 2011) and give rise to conflicts over the control of water, both at a material and symbolic level (James et al., 2012).

According to James, et al. (2012), water, as a practical and daily substance, is highly valued and deeply integrated across multiple cultures. People attribute various meanings to water ranging from an essential resource for life, a binding fabric for communities, an inherent substance for social identity, as well as a means to maintain wealth, health, social order and power (Strang, 2005a; Strang, 2005b). In Australia, conflicts over allocation of water arise between irrigation challenges and environmental conservation (Jackson, Stoeckl, Straton & Stanley, 2008), rural and urban, indigenous and non-indigenous populations (Alston & Mason, 2008a; Jackson et al., 2008), industrial water consumption and recreational water use in the public sphere (Jackson et al., 2008). Certain actions that are perceived to endanger the water resource, such as mining operations, have the potential to provoke intense backlash from residents of local communities (James et al., 2012). This thesis delves into this contested domain over the control of the GAB underground water resource among three different socio-cultural institutions in society - industry, government and civil society (including NGOs, (radical) environmentalists and Aboriginal groups).

To comprehend the social conflict arising from water issues, it is pivotal to understand how water is perceived and valued by different socio-cultural groups. A

managerial, economic and technical perspective focusing on efficiency and productivity, often from industries and to a certain extent the government authorities overlooks and underemphasises social and environmental values. This inadequate representation of the values of the broader community sets the scene for a worldview-clash (Allan, 2003; Hussey & Dovers, 2006; Patrick, 2012; Syme, Portera, Goeftb & Kington, 2008) over water allocation that will be discussed in this thesis.

The context of water scarcity gives rise to the fraught terrain of accounting and associated issues of accountability. Since the late 1970s and 1980s, critical accounting studies have emerged as an alternative perspective to acknowledge accounting's discursive and ideological significance. According to Hutchinson (1989) and Brown (2009), accounting inscribes its value as an authoritative discourse through which power is exercised and imposed. It therefore has significant influence upon social and economic exchange and conflict mediation, such as "widespread debate" on water control and allocation (Head, 2010, p.2).

As asserted by Brown (2009, p. 316), a mainstream approach to accounting is "notably monologic" and it is "overwhelmed" by capitalist assumptions. It downplays the context-dependent or social-situated nature of knowledge, depoliticises politics, and gives priority implicitly to the interests of financial capital. Such a one-dimensional viewpoint sidesteps conflicting perspectives and naturalises the "non-reporting of others" (Hutchinson, 1989, p.317). However, a body of accounting literature has recognised that the majority of 'critical' social and environmental accounting and reporting (SEAR) studies (including accounts of water) are under-theorised with respect to social conflict and dissention and its implications for wider social engagement (Brown & Dillard, 2013; Spence, Husillos & Correa-Ruiz, 2010; Tinker, Neimark & Lehman, 1991). As contended by Spence et al. (2010), this apolitical approach (in terms of ignorance of political struggles within civil society) undermines both the theoretical and practical agenda for social change.

To respond to this criticism, a stream of studies has emerged in the accounting literature to highlight political struggles and social conflicts (Archel, Husillos,

Larrinaga & Spence, 2009; Boyce, 2000; Gallhofer et al., 2006; O'Sullivan & O'Dwyer, 2009). By giving voice to alternative views and interests from socio-political constituencies (other than those from industry and sometimes the government), these counter-accounting (see Chapter 3, Section 3.2.1) studies expose the fundamental contradictions and exploitative dimensions of a capitalist system, and promote democratic dialogue and enhanced accountability (Bebbington, Brown, Frame & Thomson, 2007; Brown, 2009; Brown & Fraser, 2006; Dillard & Brown, 2012).

This thesis is concerned with a broader appeal of how water matters to a range of stakeholders. It extends water-related SEAR studies by collating and analysing accounting disclosures in the form of mandatory and voluntary social and environmental disclosures within the context of a policy debate from industry, water regulation related disclosures from governments and external alternative accounting disclosures in form of public submissions, independent academic research and web documents from civil society. It further interrogates three different modes of accountability/stewardship through the lens of water-related accounts/accounting disclosures. It is therefore aligned with the counter-accounting studies and ethos for the call for a dialogical approach to accounting to facilitate democratic participation (Brown, 2009; Gray, 1992).

By adopting a cultural risk perspective as a methodology and cultural risk theory as a theoretical framework, this thesis explicitly identifies and engages contested ideological perspectives from water accounting disclosures and discourses among divergent social groups. In this sense, accounting serves an enabling function to create social and environmental visibilities, broaden the exposure of priority and values for public dialogue and debate, promote transparent decision-making process and improve accountability discourses in the form of democratic participation (Boyce, 2000; Brown, 2009). It is important to note that this accounting system does not aim to bring premature and decisive closure or any consensually-orientated approach given that the definition for the concept of sustainability is elusive and contestable. Accounting's social worth is judged here in terms of producing conflictual reports and the ability to raise questions of contentious issues for

discussion (Brown, 2009; Frame & Brown, 2008). Figure 1.1 maps the different main areas of this thesis.

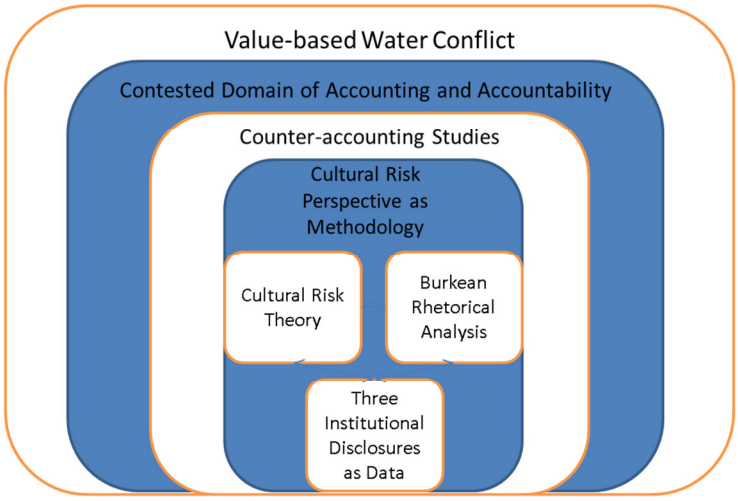

Figure 1.1 Mapping Main Areas of the Thesis

1.1 The study: GAB water governance and BHP OD mine

The term 'water governance' appeared in 2000 at the second World Water Forum held in Hague, and is referred to as

> the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society (Veiga da Cunha, 2009, p. 109).

Bearing the prospect of (re)solving social and environmental problems, water governance systems cover the establishment of legal frameworks, institutional reforms as well as efficient use, equitable access to water resources and enhanced allocation for environmental ecosystems (James et al., 2012; Veiga da Cunha, 2009). The role of politics and how diverse interests are involved in the decision-making is critical in defining the dynamics of water governance, especially in the broader context of water scarcity (Veiga da Cunha, 2009). A participatory approach to water governance "build[s] a diverse picture of water values" in terms of fairness and justice (James et al., 2012, p. 5) which "benefits from the input of broad-ranging stakeholders who, together, produce knowledge about sustainability in dialogic, ad hoc and incremental ways" (Frame & Brown, 2008, p. 228).

The mining industry is chosen as the empirical site for its importance in economic and political dimensions in Australia, as well as for the significant controversies over

its social and environmental impacts (Cortese, Irvine & Kaidonis, 2009, 2010; Stoianoff & Kaidonis, 2005). As one of the most socially and environmentally disruptive activities ever undertaken by mankind, the mining industry is generally coupled with a negative image including; pollution (ten Kate & Wilde-Ramsing, 2011), exploration of the weak and vulnerable (e.g. workers in regional areas, indigenous populations in native lands and local villagers in developing countries) and depletion of limited natural resources (Peck & Sinding, 2003).

Like the rest of the world, access to water is one of the major sustainability issues for the mining industry in Australia. The Australian mining industry at present constitutes 3.6% of the total water consumption in Australia (Barrett, 2011). Despite this relatively small proportion, the mining industry is considered responsible for a significant volume of water usage in local catchments (Barrett, 2011; National Water Commission, 2010). When mining companies' water-related activities are deemed as irresponsible, conflicts and protests often arise and, consequently, corporate water practices are subjected to a stricter regulatory scrutiny (Morrison, Morikawa, Murphy & Schutle, 2009; Morrison et al., 2010). The GAB water issue from BHP's ODEP is one such example.

According to Sampford (2009, p. 47), the Australian treatment of this underground water resource is "positively criminal". Australia has the deepest and largest artesian basin - the Great Artesian Basin (GAB), in the world and it is up to 3,000 metre deep, covering one fifth of the continent and holding an estimated water amount of 64,900km^3. Deep drilling of bores without capping over the last century has caused a massive wastage of water for the last 100 years. The BHP OD mine - Australia's largest multi-mineral mine in South Australia is located over 1,600 km from any significant water system and currently draws water at the rate of 33 ML/d from the GAB. In 2005, the mine sought to treble its output, moving from an underground operation to an open cut method. A corresponding increase in water use magnified the controversy of water scarcity and mining.

Risk discourse, in this context, has proliferated as a water governance tool to frame and manage economic, social and environmental issues (Baleta, 2012). Baleta (2012,

p. 9) provides a classification of three interrelated risk types arising from water scarcity:

> a) Risk from insufficient water resources to meet the basic needs of people, the environment and business, which in turn leads to... b) Risk from the consequences of insufficient water resources, such as higher energy prices, loss of competitive advantage, political and economic instability, population migration, or lost economic opportunities to name a few; and as a result... c) Risk from poor water management decisions taken in reaction to water scarcity, with negative consequences for some or all users. Such decisions may be a result of political or economic expediency, short term thinking, lack of knowledge or capacity or simply desperation and lack of choice.

In this thesis, these three-tier risk types are investigated from the perspectives of the mining industry, government and civil society. The debate about whether the GAB underground water system is 'replenishable' or 'inrechargeable' (Chapter 7) has exacerbated public dispute over the economic, social and environmental benefits (Chapter 8). To respond to this confronting water scarcity, GAB water resource management and planning activity led by government agencies has again triggered significant controversies over potential social and environmental consequences (re)allocated to different institutional groups within society (Chapter 9). As such, this thesis emphasises the socially constructed nature of the GAB water risk debate.

In contemporary risk research, risks have not only been viewed from a realist, techno-scientific perspective, but also a social constructivist aspect, which perceive the recognition and assessment of risk as inherent socio-political activity infused with the (re)production of shared meaning and understanding of reality (Horlick-Jones & Sime, 2004). Although contemporary water governance policies tend to be dominated by "the managerialist focus on greater efficiency" and "bureaucratic focus on authoritative processes" (Head, 2010, p. 10), these generalised, decontextualised and reductionist approaches in discipline based risk research has been insufficient for understanding the entire risk profile related to water resources issues (Baleta, 2012; Horlick-Jones & Sime, 2004). Transdisciplinary research is a potential method to address the increasingly complex water problems with an emphasis on socio-cultural expectations and value debates (Horlick-Jones & Sime, 2004; Sampford, 2009).

It is notable that the (re)solution to wicked water problems are uncertain and provisional (Head, 2010). Although a full consideration of the potentially best

desirable practice for the achievement of a democratic and fair representation goes beyond the scope of this thesis, it is acknowledged that there is a need to engage with various stakeholder groups to understand the fuller aspects of each dimension of the water issue before any possible policy adjustment or change can be achieved.

The diverse perspectives of various stakeholder groups in the water contest reflect the contentious domains of accounting disclosure and the related discourse of accountability. Accounting's discursive and ideological functions have been highlighted in critical accounting studies since the 1980s (e.g. Chua, 1986a; Dillard, 1991; Hines, 1988, 1989). Accounting disclosures do not simply provide neutral and value-free information, but rather, a set of ideological discourse, constructing the social reality with the inscription of a particular version of accountability (Brown, 2009; Messner, 2009; Roberts, 1991; Shearer, 2002).

This thesis explores the GAB water risk debate from BHP OD's water extraction by investigating corporate sustainability reports and statements, government regulatory documents, and by contrasting them with alternative disclosures in form of public submissions, independent academic research and web documents obtained from civil society. It examines how ideologies inscribed in corporate and governmental water disclosures are resisted and challenged by NGOs, environmental activists and Aboriginal groups. This thesis, therefore, is consistent with a genre of alternative accounting studies that problematises and destabilises the normalised nature and taken-for-granted assumptions of business and sometimes government (e.g. Dey, Russell & Thomson, 2011). As a result, it facilitates the articulation of, and reflection upon, different modes of accountability from corporation, government and civil society (Buhr, 2001; Rodrigue, 2014).

Consistent with a social constructivist ontology and epistemology, this thesis performs a discourse analysis approach to collate and analyse accounts for the GAB water debate. It investigates discourses within institutional disclosure documents, using rhetorical criticism in general, and Burkean rhetorical criticism as a mode of inquiry in particular. It examines how rhetoric is used by three institutions - industry, government and civil society through accounting and accountability discourses as a strategic resource to portray themselves in a particular light so as to influence debate

in society. This study seeks to advance an understanding of accounting for water by focusing on contested accounting disclosures which is further informed and explicated by a theoretical framework of cultural risk theory (Douglas & Wildavsky, 1982). By applying a Burkean rhetorical criticism framework to cultural risk theory, major sustainability-related assumptions of three institutions - industry, government and civil society become explicit and enable informed and genuine public participation in the processes of natural resource policy decision-making.

In summary, this study investigates the mandatory and voluntary water disclosures and policy debates from BHP; GAB water regulatory statements and policies of the Australian Federal and South Australian government; and, juxtaposes these with alternative disclosures from civil society to examine the constructed meanings for the GAB risk-based sustainability debate. The context is noteworthy for this study, as it delves into the contested socio-political terrain over the control of the GAB - the Australia's largest groundwater resource arising from the Australia's largest multi-mineral mine against the broad backdrop of water scarcity. This context provides a unique opportunity to analyse disclosures with their related accountability discourse.

Therefore, the following research question is identified for this study:

How do disclosures of perceived risk impact on assumptions of accounting and accountability provided by industry, government and civil society in the case of contested water sustainability of the GAB?

1.2 Methodological consideration

Although most of the water accounting studies identify water-related SEAR practices as neither neutral nor apolitical but rather ideological (e. g. Daniel & Sojamo, 2012; Egan, Frost & Andreeva, 2015; Morrison et al., 2010; Von Schwedler, 2011), the entry point of the current literature on SEAR is often at the level of managerial and economic accountability through corporate disclosure mechanisms including mandatory and voluntary sustainability type reports. In other words, they tend to be organisational or industry-focused without juxtaposing and engaging with the construction of social and environmental values and positions from other perspective such as those from governments and civil society.

This thesis adopts a cultural risk perspective as a transdisciplinary methodology to investigate ecological issues as well as accounting and accountability discourses. Positivist research with a techno-economic focus has viewed risk as an object and is insufficient to understand the entire risk profile related to water resource issues (Baleta, 2012; Horlick-Jones & Sime, 2004). Cultural risk perspective emphasises the culturally constructed nature of this debate on risk-based sustainability related concepts to facilitate public engagement and participation for the 'polyglot' problem of water governance.

This cultural perspective, unlike a psychological analysis, assumes a (proactive) organisation or institution, rather than an individual, since individuals "affiliate with organizations that resonate with their values" (Dietz, Frey & Rosa, 2002, p. 346). Risk is inherently a social construction and a cultural choice according to imperatives of an organisation (Reddy, 1996). Therefore, the cultural risk perspective combines elements of various methodologies from both positive and normative risk disciplines in a single approach (Horlick-Jones & Sime, 2004). It is located within critical theory as it assumes that rationality is embedded within social institutions and systems within a pluralist society, where risk is a real phenomenon caused by structural constraints such as the capitalist system (Baleta, 2012).

This thesis frames the contested GAB water risk to deliver and enhance public participation and engagement in policy decision-making. Participatory discourses in the form of disclosures are analysed at the institutional level. This thesis therefore brings together 'hard' - positive and objective, and 'soft' - normative and judgemental, knowledge in a transdisciplinary form. As Horlick-Jones and Sime's (2004, p. 444) assert, cultural risk perspective exchanges

> inputs and outputs… across disciplinary boundaries, in an evolved methodology which transcends 'pure' disciplines. In epistemological terms, [this] transdisciplinary [approach] involves an integration of knowledge.

Accounts in this thesis are conceived and utilised as rhetorical components of a dialogue or a conversation (Frame & Brown, 2008). By making cultural assumptions from each institution more transparent, this study exposes the pluralistic nature of accounting to promote radical change within a democratic society (Boyce, 2000).

1.3 **Method of analysis**

This study employs a critical accounting approach to acknowledge divergent ideologies and interests among different stakeholder groups to promote democratic participation through genuine 'dialogue'. It explores the GAB water risk debate from BHP OD's water extraction by compiling accounts from corporate sustainability reports and other public statements; government regulatory documents and alternative public disclosures obtained from civil society respectively.

This study performs a discourse analysis approach to collate and analyse a range of accounts for GAB water. In social theories and analyses, discourse is used widely referring to "different ways of structuring areas of knowledge and social practice" (Fairclough, 2003, p. 3). This stance is attributed to Foucault's (1976, 1980 in Alvesson & Karreman, 2000) assumption that discourses constitute both subjects and objects, and arrange and naturalise the social world in a particular way to inform social practices.

While discourse is considered as a particular way of representing some area of the world or a possible world with projected change in some directions, discourses are often alternative and competing, consistent with different social identities, positions and social relationships with others (Fairclough, 2003). In this thesis, discourse is considered to be a mode of institutional and political practice. In accordance with a culture risk perspective as methodology (Lupton, 1999), both competing and complementary discourses emanate out of interactions between BHP OD, governments and civil society around the water intake of BHP OD for the ODEP.

This thesis uses documents issued by three institutions as data sources to analyse three different sets of institutional discourses emerging from the GAB water debate. Documents define and specify things, classify events and describe processes (Prior, 2004). In this thesis, the documents issued by BHP, BHP OD and governments can be largely recruited and used as allies to support each other's actions when their interests coincided (except in some special cases - for example, see Chapter 9), while civil society tends to view these documents as enemies that need to be challenged and transformed.

Since discourses are both embodied and enacted in various texts, texts can be regarded as "a discursive 'unit' and a material manifestation of discourse" (Phillips & Hardy, 2002, p. 4). This thesis analyses textual discourses in documents. When texts are approached as elements of social events, texts are concerned as an interactive process of meaning-making (Fairclough, 2003). Discourse studies can be considered to be an analysis of text in context.

This thesis investigates discourses through a textual approach based on "interpretive structuralism" (Phillips & Hardy, 2002, p. 24). An interpretive structuralist approach is primarily concerned with how social and cultural meanings are constructed. In this study, the particular emphasis is on rhetoric. Rhetoric is the technique of using discourse for persuasive effect, and this study examines how rhetoric is used by three institutions as a strategic resource to further their views.

To analyse rhetoric, Burkean rhetorical criticism (Stillar, 1998) is adopted as a specific method to interrogate institutional documents. It is a specific method based on the assumption that rhetoric is one of the symbols to constitute the world, give it meaning and express common interests required for achieving social unity (Burke, 1950, 1966, 1969). Burkean rhetorical criticism incorporates three levels of analysis - grammar, rhetoric and logology (Stillar, 1998). The grammatical analysis focuses on the features of texts within the documents issued by three institutions and the rhetorical situation from which the production of those texts arise. Rhetorical analysis deals with the function of texts, which is how the public, as audiences, are invited by each institution to share and believe in different risk assumptions regarding the GAB. Logological analysis is concerned with social implications and the consequences of "terministic screens" (Burke, 1966, p.50). In different institutions, texts and discourses function to condense the GAB water-related reality by highlighting certain aspects of it for public attention and engagement. Burkean rhetorical criticism is applied to cultural risk theory (Chapter 6, Section 6.3) to allow the researcher to identify features, functions and implications of each institutional risk practice. Making those theoretical elements explicit, in turn, provides analytical scaffolding which facilitates an interpretation of the GAB water risk debate.

Since the GAB water risk debate is centred upon BHP OD's entitlement to the GAB water and its water management, the timeline covered by this study is from 2005, the year in which BHP acquired Western Mining Corporation (thereafter WMC), established BHP OD and applied for ODEP, to October 2011, when the final decision (Approval with conditions) from Commonwealth Federal Government, South Australian and Northern Territory Government about the ODEP was made. It is important to note that while BHP OD's direct involvement into the GAB water risk debate started from 2005, the debate has been evolving since the WMC, BHP OD's predecessor, discovered and started operating the Olympic Dam mine in 1978. Therefore, historic documents issued that are highly relevant to the GAB water controversy are also selected for analysis. The overall data therefore cover disclosures made at any time relating to this period.

1.4 **Theory to explicate**

To investigate the GAB water debate from various constituencies, a cultural risk theory (Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990; Thompson et al., 1990; Thompson & Rayner, 1998) is utilised as a transdisciplinary theoretical approach to define problems from heterogeneous domains (Lawrence, 2010). It critically explores the underlying assumptions for contentious water-related disclosures and accountability discourses (embedded within disclosures) and analyses their role in incorporating economic, social and environmental accountability into a transdisciplinary dialogue to the risk-based sustainability problems. Assessing risk as socio-political activities, cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) enables contestation among divergent interest groups, creates and enlarges institutional spaces of potentiality through which alternatives are facilitated to emerge (Brown & Dillard, 2013).

Cultural risk theory (Douglas & Wildavsky, 1982) conceives risk as social constructs determined by structural and institutional constraints of society. Risk-based sustainability policies, from this viewpoint, are a result of a constant struggle among these participants to position their risk perspective on the public agenda and also impose it on others (Baleta, 2012). Although these pluralist views of knowledge systems, lifestyles and values make direct communication difficult within society, the notion of risk spans the boundaries of all confined institutional groups to

highlight the essentiality of communication (Baleta, 2012). This locus is pivotal in the context of a water crisis, where industry (market), government (hierarchy) and civil society (border) consider water as inherently different resources.

Since the three-fold Burkean rhetorical criticism as a method in Chapter 5 identifies and interprets the features, functions and implications of discursive practices (Stillar, 1998), applying a Burkean framework to cultural risk theory allows a researcher to identify various notions for conceptualising risk-based sustainability, with the features, functions and implications of each institutional groups' risk discourses manifest within disclosures. These notions form the major concepts of cultural risk theory to analyse the discourses of the GAB water related disclosures from BHP OD, governments and civil society. In this thesis, these concepts are 'preferred learning style' (feature), 'view of nature' (function), 'property of knowledge ideal' (implication), 'attitude towards technology' (feature), 'view of risk' (function), 'resolution of risk' (implication), 'cause of ecological crisis' (feature), 'view of justice and fairness' (function), and 'property of desired system' (implication).

These nine concepts in turn are linked to three accounting and accountability related themes. A preferred learning style, view of nature and property of knowledge ideals from three institutions help to understand the contested nature of the accounting concepts of control with associated accounting recognition and measurement rules. Institutional assumptions of an attitude towards technology, view of risk and risk resolution facilitate the understanding of the stewardship debate from both mainstream and critical accounting's perspectives. Institutional perceptions of a cause of ecological crisis, view of justice and fairness and property of desired system enable the analysis of the natural resource allocation debate with its related economic consequences arguments, and the further implication for accounting practices.

Table 1.1 Application of Burkean Rhetorical Criticism Framework to Cultural Risk Theory to determine Critical Themes (see Chapter 6, Section 6.1)

Major Concepts	Market Institutions	Hierarchy Institutions	Border Institutions	Critical Themes
Grammatical Analysis				Concept of Control
Preferred Learning Style	Science (Trial and Error)	Expertise	Holism	
Rhetorical Analysis				
View of Nature	Cornucopian and Abundant	Stable within Boundaries	Ephemeral and Fragile	
Logological Analysis				
Properties of Knowledge ideal	Objectivity	Procedural Validity	Imperfection	
Grammatical Analysis				Stewardship
Attitude towards Technology	Pro-technology	Technical Fix	Anti-Technology	
Rhetorical Analysis				
View of Risk	Opportunity	Controllability	Need to Minimise	
Logological Analysis				
Resolution of Risk	Economic Growth	Regulation	Low Growth and Invasiveness	
Grammatical Analysis				Economic Consequence
Cause of Ecological Crisis	Government Intervention	Loss of Control	Inequitable System	
RhetoricalAnalysis				
View of Justice and Fairness	Equality of Opportunity	Equality before Law	Equality of Condition and Result	
Logological Analysis				
Properties of Desired System	Free Market	Governance and Planning	Social and Environmental equity	

Adapted from: Schwarz and Thompson (1990, pp.66-67, see also Ney & Thompson, 2011; 1990; Thompson, 1980; Thompson et al., 1990; Thompson & Rayner, 1998)

Cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) recognises the existence of three active (and one inactive) institutional solidarities. Each institution possesses a restricted risk position and corresponding solution according to its cultural assumptions and beliefs. These value-consistent solutions may be satisfactory to solve simple, one-dimensional problems, but unsuitable to solve complex water problems (Linsley & Shrives, 2014). In fact, each institution's assumptions of risk-based sustainability shapes the definition of the perceived water problem, and each institutional solution is only endorsed by its institutional norms and values (Linsley & Shrives, 2014).

The utilisation of a cultural risk theory (Douglas & Wildavsky, 1982) therefore forefronts topics and issues of social and environmental concern and provides a locus for transdisciplinary approaches. It delivers a typology to examine various institutions and their diverse ontological and epistemological positions. Cultural risk theory allows the topic or issue, rather than an organisation or institution of stakeholder to become the locus of analysis; discloses partisan interests from various parties; and, harnesses an interdisciplinary approach to study phenomena.

1.5 **Structure of the thesis**

This thesis is structured as follows:

Chapter 2: This chapter provides an overview of the water scarcity as an issue at global and national level. Three contested water governance paradigms are then discussed from perspectives of industry, governments and civil society with an example of contemporary Australian water reform. This is followed by a presentation of the GAB water governance and mining industry's water use in general and BHP OD's GAB water intake in particular. The GAB water debate arising from BHP OD's mining operation and the proposed ODEP concludes this chapter.

Chapter 3: This chapter provides an overview of the water scarcity as an issue at global and national level. Three contested water governance paradigms are then discussed from the perspectives of industry, governments and civil society with an example of contemporary Australian water reform. This is followed by a presentation of the GAB water governance and mining industry's water use in general and BHP OD's GAB water intake in particular. The GAB water debate arising from BHP OD's mining operation and the proposed ODEP concludes this chapter.

Chapter 4: This chapter discusses of methodological issue of risk research with its application in accounting studies. Shifted meanings of risk representing different methodologies are outlined first before the overview of realist/positivist perspective of risk. This is followed by a presentation of social constructivist perspective of risk. Throughout this discussion, the application of these diverse risk methodologies in

accounting studies are reviewed individually with a focus on cultural risk methodology in critical accounting research.

Chapter 5: This chapter explicates the research method used to examine how the GAB water risk debate is manifest through cultural practices. It begins with an overview of a critical accounting approach, discourses, discourse in documents, and text and textual analysis with reference to an interpretive structuralist approach. This is followed by a general discussion of rhetoric and rhetorical criticism. A Burkean perspective of rhetorical criticism is subsequently discussed, with a particular emphasis on grammatical, rhetorical and logological analyses. The documents used as data in this study are then presented before a final description of the process of data analysis.

Chapter 6: This chapter first introduces cultural risk theory in general (Douglas, 1970; Douglas & Wildavsky, 1982). The three folded Burkean framework of rhetorical criticism is then applied to the cultural risk theory to tease out the theoretical elements for each institutional risk discursive practices. Three critical themes derived from these institutional discourses are finally discussed with the implication for accounting research and practices.

Chapter 7: This chapter applies three major concepts from the cultural risk theory - preferred learning style, view of nature and property of knowledge ideal to analyse market - BHP and BHP OD, hierarchy - Australian Federal and South Australian government and border institutions' - civil society's viewpoints manifest in their disclosure documents in the context of the GAB water-related risks. This analysis has implications to understand the accounting concept of control of natural resources from both mainstream and critical perspectives, and it provides insights for financial accounting-standard setting in the era of impending environmental crisis.

Chapter 8: This chapter applies three major concepts from cultural risk theory - attitude towards technology, view of risk and resolution of risk to analyse market - BHP and BHP OD, hierarchy - Australian Federal and South Australian government and border institutions'- civil society's viewpoints manifest in their disclosure documents in the context of the GAB water-related risks. This analysis has implications for an understanding of the accounting concept of stewardship from

both mainstream and critical perspectives, and it provides insights for social and environmental accounting and reporting practices in the era of looming environmental crisis.

Chapter 9: This chapter applies three major concepts from cultural risk theory- the cause of ecological crisis, view of justice and fairness and property of desired system to analyse market - BHP and BHP OD, hierarchy - Australian Federal and South Australian governments and border institutions' - civil society's viewpoints manifest in their disclosure documents in the context of the GAB water-related risks. This analysis has implications for an understanding of the accounting concept of 'economic consequence' from both mainstream and critical perspectives. It also provides insights to facilitate/justify government intervention in financial accounting and reporting practices in the era of looming environmental crisis.

Chapter 10: This final chapter provides a recap of the study and detailed contributions of this thesis. It concludes the insights from previous chapters and discusses the concept of value underpinning the juxtaposed assumptions for risk-based sustainability among market - BHP and BHP OD; hierarchy - Australian Federal government and South Australian government; and border institutions - civil society. Contribution to extant accounting literature and methodology and theory are also considered with regard to the democratic participation in public policy decision making based on accounting and accountability discourses against the background of sustainability problems. A presentation of thesis limitations and further research opportunities conclude this chapter.

1.6 **Summary**

This chapter introduces the study in general - presenting background, research motivations and purposes, discussing methodology and method, and describing the structure of the thesis. The next chapter provides an overview of water scarcity and conflicts together with different water governance paradigms.

CHAPTER 2 BACKGROUND

2.1 Introduction

This chapter provides the context for the case of the Great Artesian Basin (GAB) water governance and GAB water risk related controversies arising from BHP Billiton Olympic Dam Corporation, Pty Ltd. (BHP OD)'s mining operation and the proposed Olympic Dam Expansion Project (ODEP). This context is important for an understanding of three contested water governance paradigms, from the perspectives of industry, governments and civil society, which manifest as irresolvable conflicts to date. In Chapter 7, 8 and 9, this context and different water governance paradigms will be reconsidered in light of cultural risk theory.

The next section (2.2) provides an overview of water scarcity as an issue at global and national level. This environmental, social, economic and political environment is particularly salient as it helps to understand the highly politicised relationships over water resource allocation. Three contested water governance paradigms are then discussed from the perspectives of industry, governments and civil society with an example of contemporary Australian water reform (Section 2.3). This discussion is relatively brief and will be revisited in Chapter 7, 8 and 9, as its significance is inscribed and predicated in the contested disclosures regarding the GAB water risks from the BHP OD's water intake. This is followed by a presentation of the GAB water governance and mining industry's water use in general and BHP OD's GAB water intake in particular. The GAB water debate arising from BHP OD's mining operation and the proposed ODEP concludes this chapter (Section 2.4).

2.2 Why water is an issue

Although two thirds of earth's surface is covered by water, only 1% of it is fresh water. Like any other natural resource, this water resource is unevenly distributed around the planet, with some regions enjoying relatively abundant watering and more regular rainfall, while others face a dearth of water availability (Hazelton, 2007). Climate change also poses a serious threat to the hydrologic cycle, rainfall pattern and freshwater systems (Bates, Kundzewicz, Wu & Palutikof, 2008; Intergovernmental Panel on Climate Change (IPCC), 2007; Morrison et al., 2009). According to Morrison et al. (2009), droughts, which are largely attributable to

climate change, have affected more regions [1] and caused acute shortages of water in Asia, Africa, Australia and the United States. For example, in China and India, declined water supplies have arisen from depleted groundwater and melting glaciers, which have caused receding river levels (Gleick, Cooley, Katz, Lee, Morrison, Palaniappan, Samulon & Wolff, 2007; Morrison et al., 2009). In the United States, annual river flows and natural water storage capacities are also reducing due to the shrinking snow-cap on the Rocky Mountains (Barnett & Pierce, 2008)

Population growth also results in significant pressure on water resources (Morrison et al., 2009; United Nations, 2006). Agriculture water use constitutes more than two-thirds of global usage, including almost 90% in developing countries (ESCAP, 2007). With the world population growth of fifty million per year (Morrison et al., 2009), freshwater consumption is expected to rise 25% by 2030 (Wild, Francke, Menzli & Schön, 2007). [2] Furthermore, there has been increased competition between agriculture and industry's demand for water, leaving many countries in a dilemma between the issues of water scarcity and constrained economic growth (Plummer & Tower, 2010).

Another severe problem in accessing a freshwater resource is declining water quality (United Nations, 2006). In developing countries, like China, India, and Pakistan, rising agricultural and industrial water demands, combined with a lack of adequate treatment for wastewater, have already caused heavily contaminated waterways resulting in more than one billion people short of safe drinking water (Morrison et al., 2009). For instance, many rivers have been so heavily contaminated in China that even industry cannot use the water, and more than two-thirds of the large cities in China do not have sufficient recycling or sanitation facilities for wastewater (Wild et al., 2007).

Agenda 21 (United Nations Division for Sustainable Development, 1992) ranked preservation and supply of freshwater reserves among the most urgent and important environmental issues. United Nations Educational Scientific and Cultural

[1] The percentage of 'very dry' land had doubled since 1970s, including large parts in Africa and Australia (National Center for Atmospheric Research (NCAR), 2005).
[2]According to the Food and Agriculture Organisation of the United Nations (UN-FAO) (2007), currently around 2.4 billion people - more than one third of the world population live in countries under water stress. And this number is expected to be doubled by 2025.

Organisation (UNESCO) (2006, p.524) neatly summarises the UN's assessment of global water supplies:

> Providing the water needed to feed a growing population and balancing this with all the other demands in water is one of the great challenges of this century. Providing water for environmental flows and industry will tax water resources even more.

The United Nations Committee on Economic Social and Cultural Rights (2002) has also declared access to adequate and clean water resource as one of the basic human rights.

As the second driest continent next to Antarctica (Vardon, Lenzen, Peevor & Creaser, 2007) and the driest continent with inhabitants in the world (Wahlquist, 2008), Australia is confronted with water problems such as water scarcity, declined water quality, and increased salinity (Hazelton, 2007). Apart from water availability, the causes of the current water crisis are also attributed to problematic water management (Melendez & Hazelton, 2009; UNESCO, 2006, 2009; World Water Council, 2000).[3] For example, in the early twentieth century Australia's water was "managed as if it were worthless" rather than "the life-sustaining, valuable, and increasingly scarce resource that it is" (Clark, 2007, p. 1) because of the reliability and quality of water supplies, largely due to publicly-owned utilities with low usage charges (Egan, 2009). By 1970, emerging concerns over water pollution and misuse resulted in an investigation from the Australian Federal Senate Selected Committee's into the issue of water pollution. The Commonwealth of Australia (1970) and the Committee concluded that there was little public awareness about the threats and challenges to the Australian water resource (Commonwealth of Australia, 1970, p. 184). In 1987, the Brundtland Report (1987) marked the start of global sustainability agenda and encouraged the global community to take into account the water needs of future generations and the environment. According to Egan (2009, p. 280), the Brundtland Report also "lent added legitimacy to Australian water management policies focused on demand management".

[3] Nestle's chairman Peter Bradeck-Letmathe bluntly points out that the challenges of water availability is more severe than that of energy security; and, that human beings will run out of water before fuel under the current water management (The Economist, 2008).

From the late 1990s water storage has declined rapidly and water scarcity has become acute in Australia as a result of continued droughts (Egan, 2009). According to the Australian Government Bureau of Meteorology (AGBoM) (2007), Eastern and Southern Australia have been affected by droughts since 1996, with the worst years on record in 1997/1998 and 2002/2003; while some regions in Southern-Western Australia have suffered protracted droughts for 30 years (World Meteorological Organisation (WMO), 2006). For this reason, every Australian mainland state capital since 2006 has had to deal with water restrictions due to an insufficient water supply (Melendez & Hazelton, 2009; Wahlquist, 2008).

Climate change is now widely accepted as exacerbating water risks (Plummer & Tower, 2010; Savolainen, 2008; The Economist, 2009). In 2008, the then Australian Federal Minster for Climate Change and Water, Penny Wong, stated in 2008 that, while the overconsumption and mismanagement of water have imposed a serious negative impact on Australian aquifers and rivers, climate change will worsen the situation resulting in more droughts and unreliable rainfalls (IPCC, 2007; Wong, 2008).[4]

2.3 **Contested water governance paradigm**

As with most natural resources, scarcity gives rise to opportunities for those with access. Accordingly, relationships over water resources tend to be highly politicised, especially where allocation issues abound. Generally speaking, water is understood as a multi-purpose resource and it functions on different levels and dimensions (Dubreuil, 2006). The priority of, and the focus on, different levels and dimensions leads to contested water governance paradigms[5], inspired and driven by different social and institutional preferences and interests (Allan, 2003; Dubreuil, 2006; Veiga da Cunha, 2009).

[4] The Garnaut Report (2008) notes that problematic water supply in Australia results from climate change increased population and uneconomic water pricing policies.

[5] Governance is defined as ''the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences" (Sampford, 2009, p. 51).
Water governance refers to ''the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (Veiga da Cunha, 2009, p. 109).

2.3.1 Water for development and industrial water governance paradigm

Dubreuil (2006) advances three levels and dimensions of water function. They are 'water for development', 'water for citizens' and 'water for life'. 'Water for development' is "an economic function related to production activities" (Dubreuil, 2006, p. 4). It is normally the concern of private interests including irrigation for agriculture, food and industrial production, hydropower generation as well as recreation and tourism (Wallacw, Acreman & Sullivan, 2003). For economists to formalise the benefits of water resources, a key concept termed 'production function' is used. Hanemann (2006, p. 84) defines a production function as "an empirical, causal relationship between the levels of inputs required to produce an output, or an outcome, and the level of output or the outcome that results." One example is the production function for mining, agriculture or forestry industrial output as a function of water extracted from rivers or underground resources and other inputs to the production process (Hanemann, 2006).

To fulfil the production function on an ongoing basis, it is essential that access to water of sufficient quantity and quality is available (Syme et al., 2008). From this perspective, nature in general and water in particular could and should be mastered by science and industrial technologies (Allan, 2003), along with the principle of efficiency as the primary criterion for water allocation (Patrick, 2012). It is argued that water, as a scarce resource, has an economic value, therefore should be allocated according to the principle of economic efficiency (Allan, 2003). Making water available at a subsidised price, from an industrial perspective, will generate inefficient water use, thereby contributing to water scarcity (Veiga da Cunha, 2009).

However, this economic argument is sometimes mutually exclusive with respect to the principle of social and environmental equity (Dinar, Rosegrant & Meinzen-Dick, 1997). This idea is exemplified through a focus on short-term gains derived from acute changes to natural water flows through dams, reservoirs or irrigation schemes which are unsustainable in the long run[6] (Syme et al., 2008). It is worth noting that

[6] So far there has been a view that environmental concerns conflict with economic development. In terms of contested process for water allocation decision-making, this conflict essentially is, according to (Patrick, 2012), a short-term vs long-term view. That is, water resources for immediate use or production might be in direct conflict with its long-term benefits for those in distant areas and in the future, including non-human beings and ecosystems (Syme et al., 2008).

one of the reasons for allocative water criteria to resort to efficiency-based rules is the ease and simplicity to account for and justify use (Patrick, 2012).

2.3.2 Water for citizens and government water governance paradigm

While water is considered by industry as an economic good, it is "a special economic good" due to its essential, non-substitutable, finite nature (Veiga da Cunha, 2009, p. 101). Water, therefore, can be perceived as a social good, as the benefits and costs from individual or group use of water tends to affect a larger social community within the same water distribution system (Veiga da Cunha, 2009). Dubreuil (2006) argues that it is the role of governments to act in the interest of the social wellbeing in respect of social rights of citizens. As such, 'water for citizens' is concerned with "providing water for general interest purposes, as regards public health or the promotion of values of social equity or social cohesion" (Dubreuil, 2006, p. 4).

As noted by Veiga da Cunha (2009, p. 10), this social dimension points to the "equitable use" of water resources, since water is unevenly distributed not only "in time and space", but also among "various socio-economic strata of society". How the water resource is distributed and allocated entails direct impacts on a citizen's physical and mental health, as well as their livelihood opportunities (United Nations Children's Emergency Fund & World Health Organization, 2011; Veiga da Cunha, 2009). From a social perspective, public health cannot be achieved when access to sufficient water for personal and domestic use is not safeguarded (Patrick, 2012). Basic human needs of water include water for drinking, food preparation, bathing and sanitation. Gleick (1998) suggests 50 litres of water per person per day as the minimum to secure health and the minimal standard of living in these four areas, and the state holds due diligence to protect these rights, for both intra-generational and inter-generational equity (Veiga da Cunha, 2009).

Therefore, governments have the dual goal of ensuring the supply of water to industry, as well as the basic health need of communities. These goals sometimes contradict each other (Roa-García, 2014; Veiga da Cunha, 2009). On one hand, considering water as an economic good facilitates the implementation of efficiency measures to benefit society as a whole. On the other hand, however, water allocation decisions are seldom taken purely on economic grounds, as some environmental and

social costs cannot be quantified in practice (Roa-García, 2014; Veiga da Cunha, 2009). Therefore, to decide on the most sustainable and advantageous water use in a broader social and political context, governments sometimes make water available free of charge or at subsidised cost to some water users, including industry, irrigation and domestic users (Veiga da Cunha, 2009).

Since planning for dual and often competing objectives is complicated, it is often found that "the partial achievement of one goal" has been used by governments to "offset significant failures to achieve others" (Sampford, 2009, p. 63). For example, in recent decades in Western liberal democratic societies, water has been governed and managed in "an apolitical way - as if the engineers and technocrats/bureaucrats were engaged in the administration of things" (Sampford, 2009, p. 50). Water policy and management has often been implemented through the use of market mechanisms to improve water use efficiency in an attempt to protect ecosystems that supply water for public interest (Mercer, Christesen & Buxton, 2007).

This market model of water governance by governments has raised questions about whether government values water in the general interests of civil society. There are doubts on "the agenda surrounding water decisions and prioritised stakeholders" (Alston & Mason, 2008b, p. 132). It is argued that governments have taken "a far narrower perspective" on the idea of 'water for citizen[s]' (Sampford, 2009, p. 51) by prioritising economics and overshadowing the social equity implications of water allocation (Alston & Mason, 2008b). As Alston and Mason's (2008b, p. 136) assert, these government water policies are found "neither fair nor efficient", and reflect the interests of certain stakeholder groups more than others "even in the absence of overt conflict". One reason is that governments are identified as poor community engagers, albeit the acknowledgement of the significance of community participation and engagement (Alston & Mason, 2008b).

2.3.3 Water for life and civil society's water governance paradigm

'Water for life' entails "providing water for the survival of both human beings (individual and collective) and other living beings" (Dubreuil, 2006, p. 4). As the basis of nature, water is described by Ripl (2003, p. 1921) as "the bloodstream of the biosphere". Ranaganathan et al. (2008) thoroughly document the social and

environmental benefits provided by water-based ecosystems and categorise them into four types of services - provisioning, regulating, cultural and supporting services. Provisioning services cover goods or products such as food, fibre, fuel and freshwater that can be obtained from ecosystems. Regulating services include water, air quality and climate regulation, for disease or natural hazard control. Cultural services refer to the nonmaterial benefits like spiritual, religious and ethical values that are attached to ecosystems. Supporting services are those underlying processes necessary to produce all three other ecosystem services, which involve soil formation, nutrient cycling and so on (Ranganathan, Raudsepp-Hearne, Lucas, Irwin, Zurek, Bennett, Ash & West, 2008).

From this perspective, water is treated as an environmental, social and cultural good, "not primarily as an economic good" (Hazelton, 2013, p. 276). As Syme et al. (2008, p. 332) suggest, "the moral, the cultural and the natural have always been intimately related", and the importance of water is continually reflected in rituals, ceremonies and language of a particular culture. For example, watercourses and floodplain areas hold "significant cultural and social value as a focus for spiritual, political, national or other cultural sentiment" (Environment Australia, 1998, p. 3), as they have long enabled human activities including settlement, transportation and recreation (Syme et al., 2008). People from a culture close to water or whose lives associated inseparably with water, like fishermen, give prominence to water, as well as indigenous Australians who are morally obligated to look after their country and all it contains, including surface and groundwater (Syme et al., 2008). This moral obligation also includes adequate care for current and future generations, and those beyond the scope of immediate social relations, such as ecosystems and nonhuman life forms (Smith, 2000; Syme et al., 2008). In respect of the cultural value of water, Nathan (2007, p. 4) argues that:

> [o]ur imagination ... require[s] a history of our past connections with water, a sense of how our values have shaped particular waterscapes and then ricocheted back into community life ... A scientific understanding of changes in riparian vegetation, streamflow volume, and the physical form of bed and banks are strands of knowledge that can strangle our more central stories of the natural world.

As such, the fundamental values of life are intrinsically linked to those of sustainable ecosystems including aquatic ecosystems. The value of this dimension of water function cannot be measured in monetary terms, therefore should not be administrated and managed according to market rule (Dubreuil, 2006). From the perspective of civil society, including the non-government organisations (NGOs), environmentalists and Aboriginal groups, water governance is

> not just a matter of management but of making value choices, allocating resources, avoiding inefficiencies and recognizing the dangers of market failure and the abuse of market power… [from] engineers and technocrats (Sampford, 2009, p. 51).

In other words, current water resource governance and management policies in Australia promote an economic and technical view that lacks equity considerations including the distribution of social, cultural and environmental costs and benefits (Alston & Mason, 2008b). Therefore, government authorities are required to broaden their capacity, to be more inclusive of social and cultural concerns of sustainable use of water resources and ecosystem integrity (Jackson, 2005; Veiga da Cunha, 2009). A process of transparent and participatory engagement for a shared vision is suggested especially from those marginalised communities, such as Aboriginal groups (Alston & Mason, 2008b; Jackson, 2005; Veiga da Cunha, 2009). As contended by Alston and Mason (2008b, p. 133), it is the dimension of 'water for life' that adds to the "quality of life experiences" that have not been addressed by industries at large, and governments to a some extent, with regard to their reconceptualisation of water scarcity and the value of water.

2.3.4 Conflictual facets within the contemporary Australia water reform

The Australian governments' National Water Initiative (NWI) is used to exemplify these contested water paradigms. The NWI aims to facilitate Australian Water Management Reform[7] through a coordinated approach in response to concerns over droughts and climate change (Egan & Frost, 2010; Hazelton, 2007; Melendez & Hazelton, 2009; Morrison et al., 2010). The signing of the Intergovernmental Agreement on the NWI (National Water Commission, 2007) is said to represent a

[7] SKM (2008) and Waterlines (2008) identify the problems involving in water reform, including conflicting interests of winners and losers in a new system of transparency (SKM, 2008); lack of professionals with technical expertise related to water issues, government intervention at local and state level, lack of agreement and clarity on the specific actions needed; and lack of clear accountability (Waterlines, 2008).

culminating step for water policy in Australia,[8] because critical ideas, previously in the form of "proposals and points for discussion, now have official status at a national level" (Chalmers, Godfrey & Lynch, 2010, p. 8). With assistance from the National Water Commission (2007),[9] the key objectives of the NWI are to: increase the efficiency and productivity of water use; ensure the need to service urban and rural communities; improve the health of river and groundwater system; and, establish an efficient national water market with a pricing system, trading arrangement and water resource accounting (National Water Commission, 2007).

However, the NWI incorporates tensions among key components and the challenges of associated implementation (Hussey & Dovers, 2006). In spite of its commitment to integral and ecologically sustainable water development (Hussey & Dovers, 2007), it is argued that the NWI fails to reconcile major conflicting imperatives such as those of social equity, environmental sustainability and economic rationality (Hussey & Dovers, 2006). Its incapability to accommodate the diverse aspirations of multiple participants is reflected through the focus of this reform, which is to ensure efficiency of water usage for an increasing level of productivity and competitiveness through introduction of privatisation, market and property right mechanisms, as well as the environmental flow allocation (Hussey & Dovers, 2006; Syme, 2014).

According to Hussey and Dovers (2006, p. 39), these managerial and administrative approaches are deeply rooted within "dominant neoliberal political philosophy and neo-classical economic theory, manifesting in the Australian term 'economic rationalism'". The role of market mechanisms, along with increased knowledge in hydrology are only rational from a technical, economic and organisational-centred perspective (Funder & Ravnborg, 2004), yet doubtful on environmental and social grounds (Hussey & Dovers, 2006). As suggested by Hussey and Dovers (2006, p. 43), a technical and procedural water governance paradigm shifts the logic of water resource management and planning from that of "the social and ecological" to that of

[8] Furner (2008) indicates that the Australian government's fundamental reform agenda embraces four key policy initiatives: wisely using water; ensuring water supply; supporting healthiness of river systems; and, combating climate change. New ways are suggested to increase water supply, for example, establishment of desalination plants, recycling of more wastewater, less wastage from evaporation and seepage and so on.

[9] Egan (2009, p. 285) notes that "the need for an NWC [National Water Commission] had however been flagged decades earlier by the 1970 Senate Select Committee investigation into water pollution. It was only when water became particularly scare throughout Australia that the NWC was finally established, resulting in an increasingly co-ordinated national dialogue on water reform impacting all Australian water sectors".

"the economic". Markets are seen as a social and ecological goal instead of an instrument to that goal (Common, 1995).

This above example demonstrate that the debates around water tend to be highly political and it is almost impossible, through increasingly sophisticated scientific knowledge, technology and developed market mechanisms, that optimal strategies and decisions for water allocation can be achieved (Gross, 2011). Similarly, such techno-economic approaches recommended through national water policy frameworks such as the NWI also set the scene for the governance of the Great Artesian Basin (GAB) in general and the on-going public outrage and protests over BHP's GAB water extraction for the Olympic Dam expansion project (ODEP).

2.4 **The GAB water issue**

The GAB is an underground aquifer which spans three states including Queensland, New South Wales, South Australia and the Northern Territory[10] (Endersbee, 2000a). Covering one fifth of Australia, it is one of the largest artesian groundwater basins across the world (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2013a). Australia's dependence on water is evident in its historic and continued use of groundwater from the GAB. Since 1886, drilling of deep bores into the basin has allowed the artesian water released under natural pressure to flow uncontrolledly into creeks and open drains for stock distribution (Department of the Environment, 2011). This has caused a high waste rate of 80% due to evaporation and seepage (Plastics Industry Pipe Association of Australia Ltd, 2002). Such uncontrolled development, according to Llamas and Martinez-Santos (2006), can give rise to a series of negative effects such as depletion of the water table, degradation of groundwater quality and subsidence of land. In the GAB case, uncontrolled flow has led to pressure decline - some bores and springs have stopped flowing and wetlands have desiccated (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2013a). As a consequence, the health of groundwater dependant ecosystems has been threatened, together with the continued

[10] The Commonwealth of Australia is a federation consisting of six states and two territories. They are New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania (States), the Australia Capital Territory and the Northern Territory (Territories). The Commonwealth government, is also called Australian government or Federal government.(Australian Government, 2009).

access of groundwater by local users including pastoralists (Department of the Environment, 2011).

2.4.1 GAB governance in general

Against the backdrop of a national focus on water management reform and investment, especially in the form of a national policy framework, such as the NWI, particularly heightened attention is given to the sustainable and effective 'whole of basin' management and its coordinated approach between stakeholders (National Water Commission, 2011). While each State and Territory manage the GAB water resource under their respective legislative frameworks, the National Resource Management Ministerial Council (NRMMC) established the Great Artesian Basin Coordinating Committee (GABCC) in 2004, comprising key stakeholder representatives from each State and Territory governments' advisory bodies (National Water Commission, 2011). The Great Artesian Basin Technical Working Group was set up alongside the GABCC to provide technical advice to the Committee (National Water Commission, 2011).

The Great Artesian Basin Strategic Management Plan (the Plan) was released to guide governance and management regarding groundwater and related natural resources. It is a 15-year (2000-2015) strategic framework, providing direction to all jurisdictions across the GAB on policies, supporting programs and actions essential to obtain the optimum social, economic and environmental benefits from the existent and continuing use of the GAB water resources (Department of the Environment, 2011; National Water Commission, 2011). Responding to the NWI, the Plan also embraces national policy principles on sustainable groundwater and biodiversity management, including market approaches to reallocate water savings for new usage (Great Artesian Basin Coordinating Committee, 2009b; National Water Commission, 2011). It is said to complement, rather than override existing State and Territory groundwater resource legislation and statutory responsibilities (National Water Commission, 2011).

To implement key actions of the Plan, the Australian Federal and State governments established a joint project- the Great Artesian Basin Sustainability Initiative (GABSI) with a commitment of AUD$140 million over fifteen years (1999-2014). This

initiative aims to encourage sustainable usage and maintenance of the GAB water by repairing uncontrolled artesian bores and replacing the open earth bore drain with reticulated piped water systems (Department of the Environment, 2011).

Under the Plan, there is a significant focus on the scientific and technical assessment of the nature of artesian water interaction and the characteristics of artesian springs (National Water Commission, 2013). In March 2013, the Great Artesian Basin Water Resource Assessment (the Assessment) was delivered by the Australian Government Department of Sustainability, Environment, Water, Population and Communities, Geoscience Australia and the National Water Commission is engaged the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to provide an analytical framework to facilitate water management, along with the Allocating Water and Maintaining Springs in the Great Artesian Basin research project (the GAB Mound Springs project) to investigate the operation of mound springs [11] (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2013b). Through a substantial update of geological and hydro-geological knowledge, and, an improvement of measuring and monitoring techniques (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2013a; Smerdon, 2013), it is believed that an advanced understanding of the extent and complexity of the GAB is likely to be attained through improved modelling and predictive capacity (Great Artesian Basin Coordinating Committee, 2009a; National Water Commission, 2013).

2.4.2 Australian mining industry's water use in general

Secure access to water is a feature that affects individuals, communities, the natural environment, agriculture and industry. In particular, the mining and extraction industry rely on water as a resource. The Australian mining and mineral processing sector is the world's leading producer of lead, bauxite and alumina, diamonds (by volume), ilmenite, rutile and zircon (and synthetic rutile) and tantalum; the second largest producer of uranium, zinc, and nickel; the third largest producer of iron ore, lignite, silver, manganese and gold, the fourth largest producer of black coal and copper, and the fifth largest producer of aluminium (Minerals Council of Australia,

[11] Mound springs in South Australia are "a unique groundwater discharge feature of the Great Artesian Basin (GAB), a deep regional groundwater system that covers 22% of the Australian continent. They are the principal sources of surface water in the arid to semi-arid inland heart of Australia, and have great ecological, scientific, anthropological and economic significance" (Mudd, 2000, p. 463) .

2011). As a main force of the Australian national economy, the mining industry contributed up to 9% ($115.56 billion) of the Australian GDP and accounted for 68.4% of total merchandise exports during 2009-2010 (ABARES, 2011). Australian mine production for 2010-2011 is forecast to rise by 2%, with the increasing earnings from exports of minerals and energy commodities by 30% to $182 billion (ABARES, 2011)[12].

In the mining industry, secure access to water is critical for developing and processing minerals. As the input to almost all operations, water is used in a broad range of ways, particularly for processing and separating ores from waste material (DRET, 2008; Minerals Council of Australia, 2009a; National Water Commission, 2010). The water consumption by mining industry currently makes up 3.6% of the total water use in Australia (Barrett, 2011). Although this proportion is relatively small, compared to urban and agriculture water usage, the mining industry is responsible for a significant component of water accounts in local catchments (Barrett, 2011; Minerals Council of Australia, 2009a; National Water Commission, 2010). According to the Australian Bureau of Statistics (ABS) (2006), for example, mining activities can comprise up to 73% of consumptive use outside the Murray Darling Basin[13]. During periods affected by droughts, the mining industry is a primary consumer of water within a region due to slow agricultural production and/or water entitlements purchased by mining companies (Barrett, 2011).

In addition, water use in the mining industry has rapidly increased over the last decade and will keep rising, since, strong demand especially from China and India, has "drive[n] an ongoing need for Australian resources" (Barrett, 2011, p.1). As a result, direct water use[14] in the mining industry grew from 321 GL/year in 2001 to 413GL/year in 2004/2005 and 508GL/year in 2008/2009. This figure will further escalate to 1,000GL/year in 2020, according to linear forward projections (Barrett,

[12] The time span covered by this study is concerned with BHP OD's direct involvement into the GAB water risk debate from 2005 to 2011.

[13] The Murry-Darling basin originates from two main rivers- the Murry River and the Darling River. It "covers 1,062,025 km² or approximately one-seventh (13.8%) of the total area of mainland Australia (7,692,024 square kilometres). It contains over 40% of all Australian farms, which produce wool, cotton, wheat, sheep, cattle, dairy produce, rice, oil-seed, wine, fruit and vegetables for both domestic and overseas markets. As Australia's most important agricultural region, the Basin produces one third of Australia's food supply and supports over a third of Australia's total gross value of agricultural production" (Discover Murray River™ - Official Murray River Travel Website, 2016)

[14] According to Barrett (2011) in the mining industry, direct water use is for processing, transporting and other tasks associated with production of ores. Indirect use of water includes water needed to generate energy required by mining activities. Despite the inextricable link between water and energy, the detailed discussion of indirect water usage in mining industry for electricity production is outside the scope of this study.

2011). Considering the impact of mining it is not surprising that the ODEP was controversial.

2.4.3 BHP OD's Olympic Dam mine and ODEP

The Olympic Dam (Roxby Down) mine is located in South Australia, 550 km north-northwest (NNW) of Adelaide. It is the largest known single deposit of uranium and the fourth largest copper deposit in the world. This deposit was first discovered in 1975 by Western Mining Corporation (WMC) and has been mined since 1988 (BHP Billiton, 2005). In 2005, BHP Billiton (BHP) acquired WMC resources, formed BHP Billiton Olympic Dam Corporation Pty Ltd. (BHP OD) and applied to the State and Federal governments for the expansion of Olympic Dam. Open cut methods of extraction are recommended since it is not economical to mine low grade ore under the current underground operations (BHP Billiton, 2009). Both governments later required BHP to submit an Environment Impact Statement (EIS) for the ODEP, consistent with joint EIS governmental guidelines (Wallace & Smiles, 2007).

The 4,600 page EIS was finally released by BHP on 1 May 2009, following three years of preparation (Gout, 2009). The expansion plan for the Olympic Dam incorporated three stages with the ultimate target of extracting 1 million tonnes of copper and 25,000 tonnes of uranium per annum. This EIS was available for public comment for 14 weeks (Gout, 2009), and after addressing issues of public concerns, BHP published the supplementary EIS (SEIS - the final plan) on 13 May 2011 (BHP Billiton, 2011a).

The expansion proposal of Olympic Dam resulted in extensive public debate within Australia around corresponding environmental and social issues. Generally it is claimed that, although the mine has an expected 70-100 year life, BHP has only disclosed the impact for the next 40 years, thereby underestimating at least half of their environmental impacts (Parnell, 2009). According to an anti-nuclear campaigner, Jim Green, from Friends of the Earth Australia, the uranium fuel pellets which caused the meltdown of Fukushima reactor cores were from BHP's Olympic Dam mine. He holds BHP accountable for the safety issues and fraud of the Japanese nuclear industry, accusing it of "turning a blind eye… [and] continu[ing] to peddle its toxic product to the quake-prone nation in the run up to the Fukushima [disaster]"

(Rugh, 2012, p. 2). BHP OD is also South Australia's single biggest electricity user, while the proposed expansion requires diesel fuel to increase to more than one million litre per day regardless of the enormous amount of greenhouse gas pollution (Australian Greens., 2011c; Rugh, 2012) Apart from that, concerns such as: waste management of tailings; negotiation with Aboriginal landowners; and, the use of water resources were all on the agenda for debate (Gout, 2009; Parnell, 2009). These issues are complex and this thesis will concentrate on the issue of water, especially underground water from the GAB for the period 2005-2011 that corresponds with the time span between acquisition of WMC by BHP and when the final decision from the State and Federal government about the ODEP was made.

2.4.4 The GAB water debate

BHP OD's mining operation is governed under the *Roxby Downs (Indenture Ratification) Act* (1982). Two special water licences are issued by the South Australian government to BHP OD for GAB water extraction under the criteria of an acceptable drawdown rate (Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011; *Roxby Downs (Indenture Ratification) Act* 1982) (see Chapter 8). The Olympic Dam mine uses approximately 33 million litre of GAB water per day (BHP Billiton, 2011a) via two principle borefields / wellfields, known as Borefield A and Borefield B (Great Artesian Basin Protection Group, 2009a). The proposed expansion of Olympic Dam had significant implications for water demands (Parnell, 2010). BHP OD not only needed to increase the water extraction rate from the GAB to 42 million litre / per day (maximum amount permitted under the current licence), it also planned for to establish a desalination plant at Point Lowly located in the north of Spencer's Gulf (BHP Billiton, 2009). This increased amount of water usage imposed on the GAB gave impetus to concerns that already existed and led the increasing calls for protection of the GAB from civil society stakeholder groups, including NGOs, environmentalists, and Aboriginal elders (MacPherson, 2008; Serve the people, 2008).

Apart from BHP OD's free usage of GAB water, the nature of GAB is also open to debate. Some argue that the GAB is an open system replenished by rainfall in Northern Queensland - a view favoured by the government and industry; while others argue that it is a closed system of non/renewable plutonic water (Endersbee,

2000a; Gregory, 2009). According to Endersbee (2000a), the formula used in textbooks to calculate groundwater flow is based on the key assumption that surface rainfall recharges the groundwater, which may not be the case for the GAB.

Within the uncertainty of the nature of the GAB, evidence to date shows that water extraction from the two borefields by BHP has caused declining flows of many surrounding mound springs since 1988, with some springs, such as Venables and Beatrice, ceasing to flow (Great Artesian Basin Protection Group, 2009a). This has a major effect on rare and endangered flora and fauna nearby, which are drying out due to the water drawdown rate (Great Artesian Basin Protection Group, 2009a). However, despite this ecological degradation, BHP asserts that its "use of water from the GAB is sustainable and is subject to stringent licensing and reporting requirements of the South Australian Government" (BHP Billiton, 2011a, p. 115). For example, BHP has prepared and submitted a GAB Wellfields Report annually to satisfy requirements of the *Roxby Downs (Indenture Ratification) Act 1982*. These reports rely on technical language and hydrological factors supplemented by statistic hydrogeological modelling. There is seemingly a belief that through increasingly advanced science, technology and sophisticated modelling, an optimal plan for water allocation will be achieved (e.g. Syme, 2014). However, according to Lupton (1999), scientific measures and calculative mechanisms are not fully objective or neutral as they are often understood and negotiated through human interests and values (Kasperson, 1992; Lupton, 1999; Renn, 1992).

It is worth noting that, in the case of the proposed ODEP, government interests overlap with the interests of BHP to a great extent. The South Australian Premier Mr. Rann, for example, announced in May 2009 when the original EIS was released, that "it [the expansion project] has got massive benefits for South Australia, but I will insist that world's best practice in terms of the environment is complied with" (Parnell, 2011, p. 1). According to Serve the People (2008), BHP has the resources to wield large economic and political 'sticks', and has the power to play 'games'. While BHP was waiting for the final decision following the submission of the SEIS (Supplementary Environmental Impact Statement) to Federal South Australian and Northern Territory governments, the public outrage at BHP's water grab was still on-going. Two major issues, BHP's rights to GAB water (e.g. Parnell, 2009; Quality,

2011; Serve the people, 2008) and the urgent need for funding the Cap and Pipe[15] scheme (e.g. Great Artesian Basin Protection Group, 2009c) were the most prevailing demands from these stakeholder groups.

On 10 October 2011, BHP received environmental approvals (with conditions) from Federal Environmental Minister Tony Burke for its ODEP (Department of Sustainability Environment Water Population and Communities, 2011). BHP has also signed an Indenture Agreement with the South Australian Government to enable this project to go ahead. For part of the agreement, BHP would be required to pay for the GAB water that it extracts for the first time once the expansion started[16] (Homer, 2011).

This case, presented above, is characteristic of a constant debate with multiple viewpoints promoted by different interests. From the perspective of BHP OD and the South Australian government, the *Roxby Down (Indenture Ratification) Act* (1982) is a legal framework to govern BHP OD's mining project, the associated GAB water extraction and the future water charge. Subsequently, it should encourage sustainable usage and management of the GAB water resource by incorporating diverse social, economic and environmental concerns (National Water Commission, 2011). However, these approaches largely emphasise a scientific understanding of the complex GAB groundwater system, the importance of technology in achieving water use efficiency for enhanced productivity and competitiveness, as well as market approaches such as pricing mechanisms (e.g. water levy) to protect the water resource. Nevertheless, these statistical modelling, technical efficiency and market mechanism arguments for a more robust economy are proven to be somehow insufficient for those in civil society who are concerned with water-related social and environmental impacts. After all, water is a public/common/social good, and its management cannot be reduced purely to scientific, technical and economic dimensions.

[15] According to Great Artesian Basin Protection Group (2009), since 1980s, some landholders of the GAB have began capping and piping their bores due to the realisation of unsustainable extraction and use of water from the GAB. "The water was then piped through poly pipe to tanks and troughs, where the stock watered. This eliminated the water running down open drains, and an estimated 95 percent of water was thus saved." However, capping and piping is a very expensive exercise and governments have started funding it since 1999.

[16] According to Homer (2011) this Indenture Bill will be introduced to state Parliament in which "BHP will be charged for GAB at the current NRM Board levy rate (currently $0.0318/KL) for the region (capped at $0.10/KL) for a period of 30 years from the commencement of the project. The Charge will then revert to the current NRM levy rate".

Inspired by a genre of recent social and environmental (critical) accounting studies on 'counter accounting' (Gallhofer, Haslam, Monk & Roberts, 2006) (see Chapter 3), this thesis analyses the debate surrounding BHP's GAB water intake for the Olympic Dam mine operation and the proposed ODEP from several stakeholders including; BHP, the Federal and State governments and civil society through publicly available information/disclosures. It explores the procedural, techno-scientific and economic rationality of the industry and governments by contrasting them with social and environmental concerns from civil society. This thesis will critically evaluate BHP's GAB water extraction related disclosures and the Australian Governments' GAB water governance related disclosures and compare them with external disclosures from civil society. It explores and highlights aspects of accountability supported by different stakeholder groups or institutions as a form of moral agency that underpins these contested disclosures. This position echoes the perspective of critical accounting studies, which perceives accounting as a combination of discourse and ideology (Chapter 3).

2.5 **Summary**

This chapter introduces the context of water scarcity within which three contested water governance paradigms from industry, government and civil society emerge. These paradigms are evident in the GAB water debate and BHP OD's mining operation and the proposed ODEP. The GAB water governance, the mining industry's water use and BHP OD's GAB water intake have been briefly presented. The mining industry and governments advocate a procedural, technical, scientific and economic rationality, whereas civil society including NGOs, environmentalists and Aboriginal groups are concerned with social justice and environmental equity. This will be further explicated in the thesis through the lens of cultural risk theory in chapter 6.

Since this thesis explores BHP and BHP OD's GAB reliance on disclosures, this chapter has provided a broad overview of environmental and socio-political setting for analysing these contested disclosures. The next chapter outlines different assumptions of accountability that give rise to the different ideals of water governance paradigms manifested in the form of contested water disclosures. It also

presents a critical perspective of accounting and water related social and environmental disclosures before a discussion of accountability.

CHAPTER 3 CRITICAL ACCOUNTING AND ACCOUNTABILITY

3.1 Introduction

The previous chapter presented the context of water scarcity for the case of Great Artesian Basin (GAB) water risk-related controversies arising from BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD)'s mining operations and Olympic Dam Expansion Project (ODEP). These controversies were discussed with regard to contested water governance paradigms from the perspective of industry, governments and civil society. This context reveals that the domain, within which accounting and accountability are related issues, is contentious. This chapter provides an overview of critical accounting studies in general and water accounting (disclosure) studies, in particular, to identify the discursive and ideological significance of accounting as a social practice and facilitate the discussion of three forms of accountability from the perspective of industry (BHP, BHP OD), government (Australian Federal government and South Australian government) and civil society (Non-Government Organisations (NGOs), environmental activists and Aboriginal groups).

Critical accounting approaches and methodologies are reflected in the cultural risk perspective introduced in Chapter 4. Mainstream accounting approaches, fundamentally embedded in a realist ontology and positivist epistemology, promote "the dominance of capital market[s]" (Brown, 2009, p. 315) and uncritically accept and legitimate current social institutions and practices (e.g. Chua, 1986a; Cooper & Sherer, 1984; Dillard, 1991). Critical accounting approaches, on the other hand, are based on a social-constructivist ontology and anti-positivist epistemology that views accounting as emanating from a social, environmental, political and institutional context. Accounting, therefore, is not a neutral set of practices but an ideology (Dillard, 1991; Hines, 1988, 1989). By adopting a "radically" different value position (Chua, 1986a, p. 625), critical accounting with its emancipatory potential reconceptualises social welfare and promotes interests and concerns such as social equity and environmental conservation (Arnold, 1990; Cooper & Sherer, 1984).

In the same vein, mainstream corporate water accounting and reporting practices are found to portray financial performance positively based on a particular set of capitalist ideologies, whilst excluding and silencing social and environmental values

and positions (Daniel & Sojamo, 2012; Egan et al., 2015; Von Schwedler, 2011). This thesis explores the GAB water risk debate from BHP OD's water extraction by analysing corporate sustainability reports and other public statements, government regulatory documents, and contrasts these with alternative public disclosures obtained from external sources. It investigates how the ideology or value system inscribed in corporate and governmental water disclosures is resisted and challenged by the NGOs, environmental activists and Aboriginal groups. This thesis therefore is in line with a genre of studies termed 'counter-accounting' that problematise and destabilise the normalised nature and taken-for-granted assumptions of business and sometimes government (Dey et al., 2011). As a result, it facilitates the articulation of and reflection upon different styles of accountability/stewardship from the perspective of industry, government and civil society (Buhr, 2001; Rodrigue, 2014). It therefore echoes the call for a dialogical approach to accounting which enables democratic participation (Brown, 2009; Gray, 1992).

This chapter first explores critical accounting studies in general and water related social and environmental disclosure with the notion of 'counter-accounting' in particular (Section 3.2). An emphasis is subsequently given on three forms of accountability from the perspective of industry, government and civil society (Section 3.3).

3.2 Critical accounting studies

Since the late 1970s and 1980s, a body of alternative accounting studies, including critical accounting perspectives, have emerged in the accounting literature (Andrew, 2000; e.g. Chua, 1986a; Dillard, 1991; Moerman & van der Laan, 2005; Tinker, Merino & Neimark, 1982). These studies critique the dominant paradigm in accounting, which is characterised by utility - based marginalist economic theory (Tinker, 1985).

Dillard (1991, p. 11) defines ontology as "the nature of being or reality" and epistemology as "the means or process of knowing". Stated somewhat differently, ontology is the belief of what really exists, while epistemology is about what counts as knowledge and how it is acquired. A mainstream accounting approach holds a realist ontology which views the empirical reality as "objective and external to the

subjects [observers]" (Chua, 1986a, p. 611). Epistemologically, a mainstream accounting approach is dominated by positivism, which separates theory from observation (Chua, 1986a; Dillard, 1991). Positivists believe that knowledge can be gained and accumulated through activities searching for internal coherence, consistencies and causal relationships, regardless of the values or interests of the observer (Chua, 1986b; Dillard, 1991).

A realist ontology and objectivist epistemology is fundamental to the predominate view that accounting is "a neutral set of techniques" (Roberts, 1991, p. 355), and accounting phenomena can be explained, predicted and controlled through scientific methodologies (Chua, 1986b). According to Cooper and Sherer (1984) and Chua (1986a), the scientific and technical approach to accounting uncritically accepts extant social institutions and practices, and assumes that the social order is essentially stable and controllable (Chua, 1986a). Such a mainstream approach to accounting is unlikely to reflect critically on the present system, let alone respond to the issue of radical change from a developmental, evolutionary and emancipatory perspective (Dillard, 1991).

In contrast, a critical accounting approach holds a social-constructivist ontology and anti-positivist epistemology (Dillard, 1991). Reality is considered relativistic and produced and reproduced through subjective interpretation. Criteria for judging valid knowledge are based on social experience that is temporal and context-bound (Chua, 1986a; Dillard, 1991). A study of historical development and change of an object is essential for understanding it within "the totality of relations" (Chua, 1986a, p. 622). Human beings are perceived as having inner potentiality, alienated from a full emergence through current social structures (Chua, 1986a).

Following this ontology and epistemology, accounting can no longer be regarded as only scientific, but emanating from a social sphere (Dillard, 1991). It is within social, environmental, political and institutional frameworks that economic activities take place and accounting reports covering financial, narrative and pictorial disclosures have effects on distributions of income and wealth (Cooper & Sherer, 1984). Accounting therefore is a result of social construction. It is a socially determined

technology (Dillard, 1991), which has a mutually constitutive relationship with social reality (Hines, 1988, 1989).

Critical accounting researchers question and challenge the dominant view of accounting and its underpinning ideology (Dillard, 1991). Ideology is defined as a "representation of the imaginary relationship of individuals with the real conditions of their existence", and it is inherent in "the taken-for-granted social practices and symbols that people use to interpret and organize their world" (Chua, 1986a, p. 625). According to Hutchinson (1989) and Brown (2009), mainstream accounting inscribes its value as an authoritative discourse through which power is exercised and imposed. It therefore has a significant influence upon social and economic exchange and conflict mediation as a discursive and ideological tool, legitimising particular interests and behaviour (Cooper & Sherer, 1984; Tinker et al., 1991).

While accounting information provided by business entities is designed to serve specific interests associated with profits, shareholders and the financial class (Cooper & Sherer, 1984), governments in western societies regulating accounting information hold a "conservative political agenda" (Tinker et al., 1991, p. 29) based on liberal democracy which reduces politics to a merely administrative and technical project (Lehman, 1999; Spence et al., 2010). In the absence of "any significant countervailing power" to capital, there is rarely any valid political question to consider "what kind of economic system we will construct, but rather address what kind of capitalism we will live under the shadows of" (Spence et al., p. 78).

Mainstream accounting therefore is said to promote a particular view of the importance of business, free markets and the State which "institutionalise[s] a biased version of structural conflicts" and rationalises power relations (Chua, 1986a, p. 625). In other words, it justifies a capitalist system and its patterns of advantage and disadvantage without questioning how different interests have been determined, or how the status quo has come about and is maintained (Cooper & Sherer, 1984). As such, mainstream accounting is "notably monologic" despite that it is alleged to serve pluralistic interests (Brown, 2009, p. 316).

A critical accounting perspective holds the premise that the problems of accounting potentially reflect the problems of society (Cooper & Sherer, 1984). Social conflicts

are a reflection of inherent contradictions and inequalities within the prevailing social system, instead of a mere temporary disruption (Dillard, 1991). The current social structure, therefore, needs to be critically analysed prior to a study of accounting technology (Cooper & Sherer, 1984; Dillard, 1991).

This critical perspective encourages accounting researchers to adopt a "radically" different value position (Chua, 1986a, p. 625) to expose the social conflict and dissentions and their implications for wider social engagement (Brown & Dillard, 2013; Spence et al., 2010; Tinker et al., 1991). This approach focuses on "the subjective, voluntary empowering action of individual members of society in bringing about individual, and thus social, emancipation" (Dillard, 1991, p. 14). It elucidates alternative understandings of the relationship between accounting and income, resource and power distribution within society, and suggests a different conceptualisation of social welfare that takes an aggregate view of society, emphasising the interests of other groups, such as social equity and environmental conservation, instead of those only from shareholders (Cooper & Sherer, 1984).

A dialogic approach to accounting promotes the interests and concerns of subordinate classes and social movements (Arnold, 1990; Cooper & Sherer, 1984). Subsequently, a rethink of 'recognition' and 'disclosure' criteria in accounting regulation and practice to reconcile economic imperatives with demands for social equity and justice may exist (Lehman, 1999). The following sections discuss water related social and environmental disclosures, particularly drawing upon the notion of counter-accounting (Section 3.2.1); and accountability from the perspective of industry, governments and civil society in Western liberal democracy.

3.2.1 Water-related Social and Environmental disclosure & Counter-accounting

As water is critical for industrial processes, social cohesion and ecological integrity, water has become one of the dominant social and environmental issues around the world at a time of water scarcity (Chapter 2). There has been a development of water-related accounting practices in the last decade, and this development in both measurement methodologies and frameworks for non-financial disclosures is notable in the context of regulatory and community concerns with respect to the industrial impacts on water resources (e.g. Egan & Frost, 2010; Hazelton, 2013, 2014).

In 2010, the United Nations Environment Programme (UNEP) and the UN CEO Water Mandate [17] undertook a stocktake exercise to assess the current water accounting methods/tools used in the corporate sector, with the aim to investigate "commonalities and differences among emerging methods and practices" and identify "gaps and challenges" (Morrison et al., 2010, p.6). Four major methods/tools were found to be most commonly applied, they are: 'Water Footprint'[18], 'Life Cycle Assessment'[19], 'World Business Council for Sustainable Development (WBCSD) Global Water Tool' [20]; and, 'Global Environmental Management Initiative (GEMI) Water Sustainability Planner/Tools'.[21]

While corporate water accounting has been undertaken for internal management, there is an increasing expectation for companies to disclose relevant data related to their water accounting to investors, shareholders and the general public (Morrison et al., 2010). For this reason, some water disclosure metrics and protocols have been developed by third party interests, including the Global Reporting Initiative (GRI) and the Carbon Disclosure Project (CDP).[22]

The most notable and widely applied sustainability reporting framework is the GRI Guidelines (Global Reporting Initiative, 2013). This 2013 version of the framework - G4 guidelines embraces five water-related indicators among economic, social and environmental criteria: the total amount of water withdrawal by source (EN8); the

[17] The UN CEO Water Mandate requires corporate commitment for water responsibility and reporting against that commitment (United Nations (UN) Global Compact Office, 2015).

[18] Water Footprint is an emerging tool to assess direct and indirect water usage, discharge and pollution of any group of consumers (e.g. businesses, producers, regions, etc.) and to provide better understanding of their basic water use and relationship with watersheds. It has been developed and disseminated by Water Footprint Network (WFN), a not-for-profit entity which promotes water stewardship. There are three key components in the water footprint measure: blue water footprints - freshwater from surface or underground sources, green water footprints - rain water found in soils or evaporated water and gray water footprints - polluted water (Morrison et al., 2009; Water Footprint Network, 2012)

[19] Life Cycle Assessment (LCA) is defined by International Organization for Standardization (ISO) as "compilation and evaluation of the inputs and outputs and potential environmental impacts of a product system throughout its life-cycle" (ISO, 1997, p.2). Regarding water accounting, LCA tool is particularly designed to measure water use and discharge through all components of products' value chain (Horne et al., 2009; Morrison et al., 2010). Among a number of entities which develop LCA, Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) has played an active role especially in respect of water and other environmental issues (Horne, Grant & Verghese, 2009). CSIRO Minerals recently has facilitated the LCA implementation for Australian mining companies, helping them analyse and assess environmental impacts of different metal production, including water- related impacts throughout the value chain (Morrison et al., 2010).

20 WBCSD Global Water Tool is launched in 2007 by WBCSD which is a business association promoting sustainable development (WBCSD, 2011). This free online software allows global companies with extended supply chains to calculate their water consumption and compare it with the water availability based on country and watershed. Unlike methodologies of Water Footprint and LCA, the most important feature of Global Water Tool is to access the water related business risks explicitly (Morrison et al., 2009; Morrison et al., 2010).

21 GEMI Water Sustainability Tool and Planner are two free web-based platforms to enhance companies' understanding of their water issue at both company and facility level (GEMI, 2010a, 2010b). They were released by GEMI, an organisation of companies worldwide striving for environmental and social sustainability. The Water Sustainability Tool assesses companies' relationship to and impact on water, determines water related risks and suggests responses and actions. The water Sustainability Planner helps clarify a facility's needs for water and the local watershed's status (Morrison et al., 2010).

22 BHP has disclosed water related information according to GRI, CDP and WBCSD Global Water Tool.

water source affected significantly by water withdrawn (EN9); the percentage of water recycled and reused (EN10), the total amount of water discharge by destination and quality (EN21), and finally, the social and environmental impacts of water discharge (EN25).[23]

The CDP developed a framework in 2010 to collect information from companies around the world regarding water-related policies and information (CDP Water, 2012). An annual CDP Water Disclosure Information Request is sent to companies (from 2010) and requires a reply by 30th June by using an Online Response System (ORS). CDP's water disclosure system uses information on companies' water management and governance, assessment of risks and opportunities and associated water accounting.

However, similar to critical researchers that view current Social and Environmental Accounting and Reporting (SEAR) practices as limited with respect to its sufficiency, credibility and usefulness (e. g. Gray, 2012; Jones & Solomon, 2013; Moneva, Archel & Correa, 2006; O'Dwyer, Unerman & Hession, 2005), water accounting procedures are also viewed negatively (Hazelton, 2013). In general, it is recognised that mainstream approaches to water accounting and reporting system are based on techno-scientific concepts such as neutrality, objectivity, verifiability and causality, and only provide a partial representation of a firm's performance (Bebbington & Thomson, 2007).

For example, Morrison and Schulte (2009) investigated a sample of 110 multinational corporations in intensive water using industries, and found that 80% did not apply the GRI guidelines properly; only 55% provided information on materiality assessment processes; and, 53% outlined the stakeholders' role in the reporting process. Egan and Frost (2010) reviewed the Australian food and beverage and tobacco sectors, and identify a shortage of basic disclosures of water inflows and outflows, despite of an increasing awareness of water issues. These disclosures in

23 However, Morrison et al. (2010) note that GRI guidelines do not require the disclosure of quanlitative information. In practice therefore, companies often report some limited and quatitative information (e.g. amount water usage, discharge, recycle, and efficiency of water use) without describing local water conditions. This aggregated nature of data obscures the contextual information related to water scarcity. Similarly, in another study (Hazelton, 2007) which examines the extent to which GRI indicators might improve the Australian corporate sustainable water practices, disclosure of aggregated water usage from BHP-Billiton is argued to be "of little comfort to a community if their primary water source is being unsustainably depleted" (Hazelton, 2007, p. 11). Yet to provide disaggregated data of each site for each water-extraction for BHP would be immense. Therefore, the GRI "reporting is either too superficial to be useful or too onerous to be feasible" (Hazelton, 2007, p. 4).

2013/2014 were found to decline in a more recent follow-up study (Egan et al., 2015), which suggests that investment in corporate water management and disclosure practices during the late 2000s might have decreased. Hazelton (2014), in his study of water footprint labelling of products in the Australian context, contends that the concept of a water footprint fails as an indicator of environmental degradation, because it ignores the contextual dependence and localised impact of water extraction, although it contributes significantly to a public understanding of water scarcity.

Moreover, a relatively sceptical view of SEAR is that it portrays only economic performance positively based on a specific set of institutional values or ideologies rather than a moral imperative (e.g. Buhr, 2001; Dey et al., 2011). This can be extended to reviews of water disclosures. For example, Von Schwedler (2011, p. 125) analyses the progress of sustainable development in the regulated UK water industry and remarks upon the regulatory requirement of corporate preparations of a 25-year strategic direction statement as aligned with a "'business as usual' ideology". Another study from Daniel and Sojamo (2012) points out that developing strategies around water management, encouraging water-risk debate participation, and using metrics or tools to account and disclose water risks by food and beverage companies, represents a proactive approach to risk management against a more stringent level of regulation. A similar argument is also made by Egan et al. (2015) where they found that corporate management in the food, beverage and tobacco sectors see value in disclosing internal water management information when communal interest and pressure emerges. In Morrison et al.'s (2010, p. 7) words, the disclosure of available corporate water accounting information is driven by "the desire to identify and reduce water-related business risks" through "building competitive advantage" (e.g. enhanced water use efficiency) and "ensuring long-term operational viability" (e.g. maintained or improved social licence to operate).

As such, corporate water accounting and reporting practices seem to "fall somewhere within the status quo and reformist camps", not that of the transformists[24] (Hazelton,

[24] Hazelton (2014, p. 12) summarises Hopwood, Mellor and O'Brien's (2005) three categories of sustainability proponents: "those supporting the "status quo" who suggest that market forces with minimal government regulation are sufficient to drive social and environmental outcomes, such as the World Business Council for Sustainable Development (WBCSD); the "reformists" who believe that significant government intervention is required but that the liberal democratic systems are

2014, p. 12). Water related SEAR technologies, therefore, can no longer be treated as neutral or apolitical, but rather constitutive in terms of particular social relations. According to Lehman (1999, p. 222), modern SEAR has taken "a managerial and procedural turn", therefore perpetuating the idea that "human[s] can control and manage nature". It more often than not mutes social and environmental values and positions other than those of the technical, procedural and economic, and renders alternative voices and interpretations non-existent by exclusion and silence (Archel et al., 2009; Buhr, 2001).

However, accounting studies that explicitly highlight the political struggle and social conflicts by bringing socio-political constituencies, other than those from the industry and sometimes the government are limited. In other words, the current literature on water related accounting practice tends to be organisational or industry-focused without juxtaposing and engaging with the construction of social and environmental values and positions from other perspectives, such as those from civil society. As such, Spence, et al. (2010, p. 85) argue that SEAR studies should engage with social and environmental movements, and other grass roots actions, as "it is more important to engage with the construction of the 'people' and challenge the logic of the system per se".

This thesis echoes this call and examines how BHP, Australian Federal and South Australian governments and civil society perceive sustainable water governance and management in general and BHP's entitlement to the GAB water in particular, by comparing corporate sustainability reports and statements, government regulatory documents and Hansards with alternative disclosures obtained from external sources. It explores the way in which ideology is manifest in water disclosures of the corporation and governments and is resisted and challenged by NGOs, environmental activists and Aboriginal groups.

This thesis is also inspired by the notion of 'counter-accounting' (Gallhofer et al., 2006). Counter-accounting has recently emerged in SEAR field as a stream of critical accounting research (e.g. Archel et al., 2009; Boyce, 2000; Gallhofer et al.,

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fundamentally sound, such as the Club of Rome; and "transformationists" who believe that fundamental change is required, such as neo-Marxists and deep ecologists."

2006; O'Sullivan & O'Dwyer, 2009). It perceives accounting information as a rhetorical means to manipulate social perceptions and improve corporate image strategically (Archel et al., 2009; Mäkelä & Näsi, 2010). Counter-accounting embraces

> information and reporting systems employed by [different stakeholder] groups …with a view to promoting their causes or countering or challenging the prevailing official and hegemonic position (Gallhofer et al., 2006, pp. 681-682).

The latter is largely dominated by business concerns, sometimes aligned or overlapping with those of the government (Archel et al., 2009; Gallhofer et al., 2006), whereas the former, notably environmental NGOs and other campaigners intend to reveal controversies and contradictions of existing situations by representing views of the less powerful, usually in the form of disadvantaged social groups or ecological systems (Dey et al., 2011).

Adams (2004) for example, uses the concept of accountability as a framework to compare social, environmental and ethical disclosures of a company, Alpha, with information obtained from external sources. The portrayal gap she identifies between these various perspectives is found to be mainly due to the lack of completeness in reporting, leading to the conclusion that Alpha is not a highly responsible or accountable company to its key stakeholder groups.

Mäkelä and Nasi (2010) combine stakeholder theory, legitimacy theory and the concept of social contract. They demonstrate how a multinational corporation understood corporate social responsibility differently from its employees, governments and the community in a case of organisational downsizing, by contrasting corporate reports with media articles. They find that while employees and their representatives adopt a social stance on the downsizing issue, the corporate argumentation is dominated by an economic dimension.

Similarly, Archel et al. (2009), by expanding the scope of legitimacy theory, captures different channels of information to examine diverse views on a lean production process introduced by a corporation. Two types of discourse are revealed - the economic discourse represented in corporate annual reports and social discourse from employees on welfare issues. More specifically, they find that the State government supports and assists corporate legitimising strategies through ideological

alignment, as opposed to the concerns of the employees, such as working conditions and life quality.

The initial concern of counter-accounting activities is to problematise and destabilise the normalised nature and taken-for-granted assumptions of business and sometimes the government (Dey et al., 2011). In the same vein, counter-accounts often encompass the development of a counter-narrative (and metaphors) (as opposed to quantified indicators) to facilitate other voices (Boyce, 2000; Dey et al., 2011; Everett, 2004). This recognition and acknowledgement of alternative perspectives forms the initial step in the transformative potential of critical accounting and ethos the call for a dialogic approach to accounting which facilitates democratic interaction and participation (Brown, 2009; Gray, 1992).

This thesis explores the procedural, techno-scientific and economic rationality of the corporation and governments through juxtaposing and contrasting them with social and environmental concerns from the civil society manifest through various disclosure documents. It exposes the fundamental contradictions and exploitative dimensions of capitalist systems to promote a democratic dialogue (Brown, 2009; Brown & Fraser, 2006). This thesis consequently allows different styles of accountability from corporations, governments and civil society to be articulated and reflected upon (Buhr, 2001; Rodrigue, 2014).

3.3 **Accountability**

Accountability is a sociological term that "denotes the exchange of reasons for conduct" (Messner, 2009, p. 920). It relates closely to one principle purpose of financial reporting - stewardship, and the other one is decision-usefulness (International Accounting Standard Broad (IASB), 2001, IASB Framework para. 12; 13; 14). In fact, in July 2005, IASB proposed not to designate 'stewardship' as a separate objective of financial reporting in their converged framework. Instead, this conceptual framework should acknowledges that

> financial information directed at the primary objective of providing information useful for investment, credit, and similar resource allocation decisions is useful for other purposes, including assessing management's stewardship (IASB, 2005a, Framework para. 24 in O'Connell, 2007).

This proposal means that although stewardship will still be indicated in the framework, it is subsumed by the main objective of financial reporting to provide decision-useful information. Stewardship/accountability refers to the efficient administrative and executive plans for consuming and conserving resources, which include directing and controlling material and human resources of an organisation, and maintaining and reporting on the custodianship/stewardship decision of resources (Chen, 1975).

Stewardship/accountability is derived from property rights and is based on the idea that managers as agents look after the assets or resources which are entrusted to them by the owners (IASB 2001, IASB Framework para.14). The concept of stewardship/accountability has evolved through historical development from traditional custodial relationship to the modern concept of managerial performance (O'Connell, 2007; Pannell, 1979). According to Chen (1975), the managerial stewardship concept covers not only the accountability to immediate owners-shareholders' interest, but also social accountability. In other words, it requires managerial accountability to not only embrace the "resolution of agency problems between management and owners" (Shearer, 2002, p. 562), but also extend to the accountability of environmental assets.

Following this logic, it can be argued that financial accounting reports are reports of and reported by management on its stewardship/accountability (Chen, 1975; O'Connell, 2007).

> [I]t is management's point of view that the accountant should adopt in order to define the objectives of financial reporting, to analyse transactions, and to provide financial statements pertinent to the evaluation of management's performance as a steward (Chen, 1975, p. 542).

However, according to Sinclair (1995, p. 219), accountability is an "elusive" concept, and its meaning is nuanced dependent upon its context. An increasing body of accounting literature has demonstrated the different forms and multi-dimensions of accountability, such as Sinclair's (1995) political, public, managerial, professional and personal accountability, Roberts' (1991, 2003) hierarchical and socialising accountability, Benston's (1982) corporate accountability, Shearer's (2002) economic accountability and Gray's (1992) democratic accountability. Yet whatever

form and meanings one adopts, accountability unavoidably attempts to reflect "symbolically upon the practical interdependence of action", that entails "both moral and strategic dimensions" (Roberts, 1991, p. 356).

While the concept of accountability can be simply referred to as "the duty to provide an account of the actions for which one is held responsible" (Gray, Dey, Owen, Evans & Zadek, 1997, p. 334), there are social values featured by different stakeholder groups (institutions) which define who is expected to account to whom, for what, and in which manner (Messner, 2009; see also Shearer, 2002). In Schweiker's (1993, p. 235) words,

> giving an account is one activity in which we come to be as selves and particular kinds of communities through forms of discourse that shape, guide and judge life regarding concern for the common good, human solidarity and basic respect.

The competing views of stewardship/accountability therefore hinges on an understanding or disclosure of that which a company is said to control and manage. For the purpose of this thesis, managerial accountability, administrative accountability and moral accountability resonate with 'ideal' forms of accountability which BHP OD, the Federal and South Australian governments, and civil society have towards the GAB water resource respectively. It is the fundamental concepts of rights and obligations drawn from these different forms of accountability that the different institutions identify for its actions and undertakings as an account for legitimacy (Shearer, 2002).

3.3.1 Managerial accountability

Managerial accountability[25] is normally assumed by private entities (Messner, 2009; Shearer, 2002). This accountability portrays human identities as merely economic subjects guided by self-interests, and restricts social relationships to economic terms (Messner, 2009; Roberts, 1991). In other words, when providing interpretations and justifications for its actions, a business entity will draw on the accepted motivations and rationales of economic subjects such as individualism, utilitarianism and an instrumental value of good (Arrington & Francis, 1993; Messner, 2009; Shearer, 2002).

[25] See also economic accountability by Shearer (2002), financial or hierarchical accountability by Roberts (1991, 2003).

What underpins these assumptions is a strong liberal belief based in neoclassical economics that an individual should be free to pursue his or her vision of the good (Shearer, 2002). 'Value' of the good is not inherent in the good itself, but rather within that good's relationship to the satisfaction of human needs and desires. Natural resources are treated, therefore, as economic goods objectified for efficiency and profit maximisation (Shearer, 2002), and are normally controlled and managed by modern science and technology through calculation, quantification and prediction (Gray, 1992; Power, 2007).

Similarly, managerial accountability does not take into account the existence of social and environmental costs (Freedman & Stagliano, 1990; Lehman, 1996). There are two reasons for this. First, managerial accountability presupposes that the common good is the outcome of a free exchange which can be achieved by the pursuit of private interests.[26] It does not acknowledge that shareholder interests do not necessarily serve the collective or common good of the wider community (Shearer, 2002). Therefore, the issue of managerial accountability is dependent upon "the extent or resolution of agency problems between management and owners", not

> the possibility that society holds corporate owners accountable to a [common/public] good [such as social and environmental costs] that is not congruous with these owners' private interests (Shearer, 2002, p. 562).

Second, managerial accountability is based on the dominant neo-classical economic supposition that social and environmental costs and benefits are immaterial, thought to be unquantifiable, therefore unmeasurable, in the domain of a free market (Freedman & Stagliano, 1990). When natural resources such as water become scarce, the best way to protect them is to assign a monetary value to ensure that the market allocates water according to its best use. It is important to note that advocates of managerial accountability characterise the market as a 'fair' distributive mechanism, which is considered to "reward the 'productive' fairly with pecuniary compensation and to punish the 'non-productive' justly with failure" (Young, 1996, p. 49). Direct intervention, such as government regulation, therefore, is perceived as inappropriate unless it is aligned with principles of the free market (Young, 1996). Managerial

[26] This point is evident in Benston's (1982) essay on accounting and corporate accountability towards shareholders. 'Corporate accountability', from Benston's perspective means 'managerial accountability', and it is a meaningful issue because managers have discretion to use the resources from shareholders in a way that do not serve shareholders' interests.

accountability favours economic instruments such as water licences/rights/permits to protect the environment (Jones, 2010).

3.3.2 Administrative accountability

Administrative accountability [27] derives from Westminster traditions of the responsibility of public servants (Funnell & Cooper, 1998). These public servants exercise authority on behalf of elected representatives, who hold direct accountability to the public (Burritt & Welch, 1997; Sinclair, 1995). In modern liberal democracies, a Westminster government is said to be accountable to parliament and the people for "governing in the best interests of all citizens according to accepted conventions or legally prescribed processes" (Funnell, 2003, p. 107).

Government policies, accordingly, have a social value base, which is influenced by social needs and perceptions of doing the right thing. The underlying reason is assumed to be a mechanism "keeping the population safe from threats of discord, violence or, more broadly, freedom from fear" (Ball & Grubnic, 2007, p. 247). Government policies are considered to reflect the collective by focusing on a group of citizens instead of individual consumers' choices (Burritt & Welch, 1997; Parker & Gould, 1999).

It is notable that the necessity of government regulation is embedded in the notion of a common/public good. Common/public goods, from the perspective of the government, are common properties which are perceived as necessary for the enhancement of both the economic and social well-being of a nation (Barton, 2006; Pallot, 1992). With respect to the common/public goods as natural resources, the government objective is to preserve them in good condition so as to provide social and environmental benefits to the public in perpetuity (Barton, 1999). Under circumstances where a private entity uses a public resource to produce private goods, governments normally restrict its commercial activities by realigning the private, social and environmental costs through regulation or by levying 'green taxes' to remedy the problem of externalities (Barton, 1999).

[27] See also constitutional accountability by Funnell (2003).

Government policy decisions are usually referred to as a "fair resource distribution" (Ball & Grubnic, 2007, p. 252) around "which public goods are to be provided, in what quantities and to whom, and their method of funding" (Barton, 1999, p. 25). Although governments are considered to have multiple roles i.e. to make the private sector accountable for its commercial performance, as well as the responsibility for social justice and environmental protection against the backdrop of sustainable development (Burritt & Welch, 1997), Western liberal democratic societies over the last three decades have largely concerned themselves with increasing economic growth, achieved through "passing more power to the market, coupled with steadily decreasing levels of political engagement from the demos" (Spence et al., 2010, p. 78). According to Tinker, et al. (1991, p. 29), modern liberal democracy is founded on pluralist political assumptions. These assumptions include

> a belief that no undue concentrations of power exist that confer systemic advantages to some groups; that, notwithstanding their differences, social protagonists share a common interest in sustaining the whole system; and that the state pursues a neutral, mediating role in conflict resolution (Tinker et al., 1991, p. 29).

In other words, the government is considered as providing "a neutral marketplace" where aggregate social preferences are expressed in the political process (Arnold, 1990, p. 179), and the democratic electoral and legal system and the market can function in "a desirable manner" (Tinker et al., 1991, p. 29). Regulation, as such, is deemed as a response to public demand and therefore upholds the public interest (Arnold, 1990). Government policies involved in modelling, standard-setting, monitoring, reporting and enforcement mechanisms are said to align with the prevailing business model (Burritt & Welch, 1997).

From a civil society perspective, managerial accountability has an overriding concern with the individual and profits that serve to negate the very obligation to broader social and environmental distributive justice (Schweiker, 1993; Shearer, 2002). Administrative accountability, albeit allegedly taking a social value base, is vested in agreed procedures and rules supported by government regulatory coercion (Puxty, Willmott, Cooper & Lowe, 1987), which is concerned with political pragmatism and acceptance rather than social and environmental equity and justice (Tinker et al., 1991). Administrative accountability, therefore, is merely a short-term

solution mechanism (Lehman, 1996), unlikely to rectify social ills fundamentally from "waste, exploitation, extravagance, disadvantage or coercion" (Tinker et al., 1991, p. 29). According to Buhr (2001), Lehman (1995) and Tinker, et al. (1991), managerial accountability and administrative accountability are the forms most commonly seen in current western liberal societies, and subscribes to 'business-as-usual' and 'middle of the road' cases for sustainability .

> As a steward, management's performance should be evaluated in terms of both profit and the accomplishment of social objectives. The latter aspect has long been neglected by the accounting profession (Chen, 1975, p. 542).

As Andrew (2007) asserts, managerial and administrative approaches to accountability focus mainly on the scientific, technical and procedural dimensions of accountability rather than ethical and moral dimensions. For example, the internalisation of externalities through regulation that requires modelling, standard-setting, efficiency-oriented performance measures and green taxes that are numerical in general, and monetary in particular, reinforces scientific and analytical solutions (Gray, 1992). In the meantime, it neglects the full social and environmental costs that are beyond monetary value (Beder, 1997; Dumay, Guthrie & Farneti, 2010).

This ostensible objectivity with both "positive and negative sanctions" surrounding managerial and administrative accountability make it "the image of events that counts" (Roberts, 1991, p. 363) and often entails "unintended and unacknowledged moral, social and environmental consequences that spill out from the pursuit of strategic objectives" (Roberts, 1991, p. 367). According to Lehman (1999, p. 518), managerial and administrative accountability form a "strict liberal accountability" framework perpetuating the status-quo by simply providing information so as to allow efficient utilisation of scarce resources without critically analysing what a corporation is doing to the environment and society.

Therefore, managerial accountability at large and administrative accountability to some extent reflects "a sense of self as solitary and singular with no necessary connection to others" (Roberts, 1991, p. 358). That is, managerial accountability and administrative accountability can be considered as "a self-referential exercise" (Shearer, 2002, p. 559) which justify one's actions for one's own sake (Messner, 2009) and constructs social relations in a way that the moral obligation to others tend

to be diminished if not silenced (Shearer, 2002). In Adam's (Adams, 2004, p. 732) words, the alignment of these two forms of accountability brings into focus "sustainability of the business [and government] rather than [social and] environmental sustainability". This separation of strategic and moral dimensions of accountability is detrimental of both strategic and ethical concerns (Roberts, 1991). This combination of managerial and administrative accountability is reflected in the cultural risk model adopted in this thesis as both market and government institutions form a strong centre.

3.3.3 Moral accountability

To challenge the problematic capitalistic and governmental structures and mitigate environmental damage and social inequity, a wider concept of accountability is suggested by civil society. This form of accountability can be termed 'moral accountability'[28] which is a fundamental and more encompassing and democratic form of accountability to cover the ethical requirement of accountability to the other (Messner, 2009; Shearer, 2002). According to Shearer (2002, p. 559), to be accountable to the other is to acknowledge "a non-instrumental relationship", which is a relationship of obligation to or responsibility for the other that cannot be discharged by reference merely to one's own interest. As Roberts (1991, p. 358) contends, moral accountability can enact "a sense of self which, whilst individually confirming, simultaneously acknowledges and expresses the interdependence of self and other".

Moral accountability embraces ethical concerns regarding "the moral status of economic collectivities, including the scope of the moral community and the good that this community seeks" (Shearer, 2002, p. 541). It is the moral community within which private entities and governments are situated that defines "whose needs count and whose goods are sought" (Shearer, 2002, p. 546). Moral accountability, therefore, considers an identity answerable to wider social interests and encompasses a wider scope of common/public good, apart from the private good (Schweiker, 1993).

> What we account for (actions, outcomes, intentions, relations) and our substantive notions of what is good are bound up with these relations to others and ourselves. As we will see, the social nature of giving an account…

[28] See also socialising accountability by Roberts (1991, 2003), and democratic accountability by Gray (1992).

> is the roots for developing claims about distributive and social justice (Schweiker, 1993, p. 224).

Moral accountability consequently cultivates openness and dialogue rather than scientific, technical and economic reasoning (Messner, 2009). The development of moral accountability can be regarded as a liberating social process with "a means to define and re-define community, to create closer social relationship and bring power back to "the People"" (Buhr, 2001, p.409). In this practice, others are encountered more directly and relationships between self and others developed more fully than merely fundamental utility that is demanded or officially required (Roberts, 1991). This moral relation to others necessitates mutual understanding beyond the giving and receiving of accounts through formal categories provided by managerial and administrative accountability (Messner, 2009). It requires face-to-face communications to facilitate openness and mutual understanding in the absence of hierarchical power dynamics and especially seeks to make the voice of the most vulnerable heard (Messner, 2009; Roberts, 1991).

Moral accountability, therefore, involves democratic participation to make corporations not only comply with legal relationships, but also undertake "a process of negotiation, explanation and articulation" which seeks to create "a sense of belonging and understanding in the community" (Lehman, 1999, p. 232). In this case, moral accountability requires negotiation and explanation concerning whether a local community wants mining development, and whether they are given a fair hearing. Moral accountability

> offer[s] the possibility of a more complete recognition of self, the engagement of personal understanding and the challenging of others' views and expectations. Out of such relationships is built mutual understanding and ties of friendship, loyalty and reciprocal obligation; a sense both of individual difference and mutual dependence. Self is confirmed but in a way that simultaneously acknowledges and articulates the interdependence of self and other (Roberts, 1991, p. 363).

To promote democratic dialogue and discharge moral accountability, critical accounting (counter narrative) can act as an enabling tool that facilitates decisions of the community in a fairer and more equitable manner (Schweiker, 1993). Critical accounting (counter narrative) "can be developed as part of a public sphere

committed to exposing and explaining corporate effects on 'the world' and to reflect on what is 'significant' for communities" (Schweiker, 1993, p. 220).

The utility of such accounting is not in its representation of "infallible truth"' but in its creation of a range of environmental and social visibilities and exposure of values and priorities that become inputs to wider democratic processes of discourse and decision making (Boyce, 2000, p. 53).The case of BHP OD's water intake plan and the associated controversies of ODEP provide an opportunity to explore different forms of accountability. By comparing corporate sustainability reports and statements, government documents with alternative disclosures obtained from public submissions and other external sources, this study opens the door for a development of constructive participatory democracy, along with critical (counter) accounting's emancipatory potential.

3.4 **Summary**

This chapter explored critical accounting studies generally and water related social and environmental disclosure specifically. This thesis is predicated on the assumption that mainstream accounting and reporting practices promote a capitalist ideology and economic interests while silencing social and environmental values.

Since this thesis examines the GAB water debate arising from BHP OD's Olympic Dam mining operations, the study will analyse the way in which ideology is inscribed in the water disclosures of corporations and governments and resisted and challenged by NGOs, environmental activists and Aboriginal groups. The study is located within critical accounting studies with a concern of a broader appeal of how water matters to a range of stakeholders. It exposes the fundamental contradictions and exploitative dimensions of capitalist system, and promotes democratic dialogue within society (Bebbington et al., 2007; Brown, 2009; Brown & Fraser, 2006; Dillard & Brown, 2012). Three types of accountability were also introduced in this chapter to facilitate an understanding of the rationality differences between BHP OD, governments and civil society. These different accountabilities map directly to a cultural risk model that explores markets, governments and civil society at an institutional level.

The following chapter examines a cultural perspective of risk as the methodology that this thesis adopts to investigate different institutional positions towards the GAB water related social and environmental risks manifest in respective disclosure documents.

CHAPTER 4 METHODOLOGY

4.1 Introduction

Chapter 3 reviewed the critical accounting studies in general and water accounting studies in particular and included a discussion of three styles of accountability that underpins the rationality and value differences among BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD), governments and civil society in relation to the Great Artesian Basin (GAB) water debate. This chapter presents a cultural perspective of risk as an appropriate methodology to examine different institutional stances towards the GAB water related economic, social and environmental risks manifest in contested water disclosures. This methodology is anchored in a transdisciplinary approach that emphasises socio-cultural expectations and value debates (Horlick-Jones & Sime, 2004; Sampford, 2009).

Risk, from a cultural perspective, is nuanced and water, as a scarce and valuable resource, is valued differently across a range of institutions according to different cultural patterns and belief systems (Lupton, 1999). By adopting a culturally inspired construction of risk, this thesis investigates the socially constructed nature of the GAB water risk debate and how it is linked to different assumptions underlying various institutional disclosures and the related issue of accountability.

There has long been a struggle between positivism and social constructivism in the field of risk research. The term ‘risk’ came to light during the transitional period between late Middle Ages and early modernity (Lupton, 1999). Throughout the centuries, the meaning of risk has changed in its proliferate application to diverse situations (Luhmann, 1993). In pre-modern times, humans were preoccupied by the mysterious power of fate; and risk awareness often arose from uncertainties about the future. Natural disasters such as earthquakes, floods, storms, famines or epidemics were perceived as risk, since they created disorder outside the control of mankind (Luhmann, 1993; Lupton, 1999). The notion of risk was expanded by the nineteenth century. Instead of being located exclusively in nature, risk was also acknowledged in human conduct. Unexpected outcomes may come as a result of human action and has resulted in the modern way of looking at the world and its chaotic manifestations, uncertainties and contingencies (Lupton, 1999).

In a modernist view, risk is distinct from uncertainty, in that, the likelihood of an unanticipated event happening is estimable therefore manageable (Lupton, 1999; Renn, 1992). Uncertainty, conversely, presupposes a form of "indeterminacy" that is not subject to any probability evaluation (Reddy, 1996, p. 227). This "managerial distinction" (Power, 2007, p. 5) is derived from the development of scientific knowledge and rational thinking which is deemed as the key to human civilization and progress. It assumes that the social order and laws of nature may be measured, calculated and predicted (Lupton, 1999). As such, once uncertainty transforms into a form of risk through organising, it is subjected to rationalised counting, ordering and therefore, becomes manageable (Moerman & van der Laan, 2012; Power, 2007). Risk can also be used as a "neutral" idea incorporating both 'good' and 'bad'. It represents the possibility for the occurrence of certain incidents associated with either losses or gains or both (Douglas, 1992, p. 23).

Accounting systems have long played a pre-eminent role in the risk assessment and management of modern economic entities (Bebbington & Thomson, 2007; Miller, Kurunmäki & O'Leary, 2008; Moerman & van der Laan, 2012; Power, 2007). Being understood conventionally as "the process of identifying, measuring and communicating economic information to permit informed judgments and decisions by the user of that information" (American Accounting Association, 1966, p. 1), accounting practice is used to present an objective, true and fair view of the entities performance, including risk related calculations and cost-benefit analyses (Bebbington & Thomson, 2007; Young, 2001). Shifts in the meaning of risk connotes that the identification and conceptualization of risk is not static and one-dimensional, but is dependent on both historical and social-cultural contexts (Lupton, 1999). Particularly, it is dependent on the methodological framing of both the questions about risk and the subsequent means to find 'solutions'.

This chapter outlines the methodological issues in risk research with its application in accounting studies. An overview of a realist/positivist perspective of risk (Section 4.2) is provided before a discussion of a social constructivist perspective of risk (Section 4.3). Throughout this discussion, the application of these diverse risk methodologies in accounting studies are reviewed with a focus on cultural risk in critical accounting research.

4.2 **Realist/Positivist perspective of risk**

Risk criteria are framed and defined to enable the prioritisation of actions within social systems. According to Renn (1992, p. 54), core questions collateral to a risk debate include questions such as;

> [w]hat criteria are appropriate for dealing with risk? How safe is safe enough? Should society adapt a set of uniform criteria for all types of risk regardless of context? Who should be involved in designing these criteria? Who should be held accountable if the criteria prove inadequate?

The responses to these questions vary according to different perspectives in society (Bradbury, 1989). If risk is viewed as pre-existing in nature and as an objective attribute of an activity or event, risk is identified and ordered through scientific measures and calculations of probability and magnitude of harm (Lupton, 1999; Renn, 1992) and result in the technical, economic and psychological perspectives of risk outlined below.

4.2.1 A technical perspective of risk

Technical approaches to risk stem from fields such as statistics, engineering and epidemiology and combine the notion of physical danger and hazard with a measurement instrument (Lupton, 1999; Renn, 1992). Risk here is defined as a "product of the probability and consequences (magnitude and severity) of an adverse event" (Bradbury, 1989, p. 382). Using models or observed relative frequencies, a technical approach anticipates the likelihood and the average of past risk events over time and space to estimate the magnitude of a negative effect. This focus on combining risk assessment and risk management underlies the prevalent risk analysis paradigm (Kasperson, 1992; Lupton, 1999; Renn, 1992).

Accounting has been considered important to the development of risk analysis (Power, 2007). Through capturing, quantifying and communicating financial risk, traditional accounting systems help to "tam[e] incalculable uncertainties as calculable risks" (Power, 2007, p. 13) in the processes of corporate management and governance (Bebbington & Thomson, 2007). Social and environmental accounting and reporting practices are perceived to carry the same role in organisations with the extension of corporate accountability into social and environmental dimensions of activity (Gray, Owen & Maunders, 1987).

However, a formal risk analysis, accompanied by an ill-masked system of expert knowledge, produces flawed and biased risk management practices, (Dietz, Frey & Rosa, 2002; Lupton, 1999; Reddy, 1996). Experts, while seeking the artefactual status of objective knowledge, tend to ignore underpinning value positions or assumptions (Lupton, 1999; Wynne, 1989). This is also the case for accountants. According to Bebbington and Thomson (2007, p. 41), the fact that accountancy professionals "promote themselves as experts in evidence-based governance and decision-making" is based on "an implicit assumption" that the objective, verifiable and rationality-based decision making process is most appropriate to manage risks. And this belief is pervasive in their official reports and statements.

Yet accounting's role as an ideological weapon that goes beyond a merely technical practice is increasingly recognized and well-documented by a large number of alternative accounting researchers (e.g. Chua, 1986a; Dillard, 1991; Hopwood, 1987; Miller, 1994; Power, 1994). Accounting, "as social and institutional practice" (Miller, 1994, p. 1) implicates the context within which it operates as a "intervening ... device for acting upon activities, individuals and objects in such a way that the world may be transformed" (Miller, 1994, p. 2). It confers "a particular form of visibility" through calculating and recording certain processes or events in order to "alter the way in which it can be thought about and acted upon" (Miller, 1994, p. 1). By doing this, accounting may "tend to give undue prominence to values that can be calculated, not necessarily to the most significant" (Douglas & Wildavsky, 1982, p. 70; see also Reddy, 1996). Additionally, this bias is not only restricted to the "numerical computations" of costs, profits, losses and returns since accounting also involves "complex language and meanings" (Miller, 1994, p. 3). Young (2001, p. 607) for example, analyses the risk-related language from the Financial Accounting Standards Board (FASB), and highlights the way in which "metaphors have contributed to the thinkability of risk management". In this article, risk is depicted metaphorically as "exposure, disease, burden and adversary" (Young, 2001, p. 620) which is consistent with the idea of an "opponent" that "must and should be confronted and managed" (Young, 2001, p. 607).

Since technical risk analysis does not represent an objective, neutral, absolute and universal truth (Bradbury, 1989) experts, such as accountants, attempt to reify and

objectify the localised nature of risk measurement and calculation. In so doing they separate the socially and culturally shaped components of knowledge and reduce them to certain subjective values (Bebbington & Thomson, 2007; Lupton, 1999; Miller, 1994). This fact/value dichotomy (Bradbury, 1989; Rayner, 1992) is apparently convenient and attractive for science exponents to seek simple solutions to complex situations (e.g. Cohen, 1985). From this perspective, laypeople or public sources of knowledge are seen as 'inappropriate' or 'incorrect', in comparison to the 'superior' and 'sophisticated' knowledge of experts (Lupton, 1999).

4.2.2 An economic perspective of risk

The realist perspective of risk is also reflected in the economic notion of costs and benefits associated with expected utility losses arising from an activity or event (Dietz et al., 2002; Reddy, 1996; Renn, 1992; Short, 1984). Here, the criterion to predetermine undesirable effects used in the technical perspective is substituted by the subjective satisfaction to "make benefits and risk commensurable" (Renn, 1992, p. 63).

According to Miller (1992), accounting is identified as a commensuration practice that makes "activities and processes whose physical characteristics and geographical location may bear no resemblance" comparable by according them "the single figure" (Miller, 1992, pp. 68-69). The problem of incommensurability occurs because the emphasis is to "assign monetary values to all costs and benefits" (Dietz et al., 2002, p. 333). This approach is less problematic if the value is assigned to certain benefits, say, productivity. However, it is a serious issue when assigning costs arising from health, ecological and social risks (Dietz et al., 2002; Krimsky & Golding, 1991; Reddy, 1996). In a study investigating the implementation of private sector accounting in public prison entities, Mennicken (2011) argues that accounting and risk management, while promoting an individual prison's financial performance, shifts the focus from "the individual prisoner... [and] the Prison Service as a whole" to "individual prison establishments." It consequently results in "a systemic decentring of Prison Service accountability" (Mennicken, 2011, p. 18).

Another critique of the economic model of cost-benefit-analysis is centred on the fundamental philosophical underpinning of the economic approach - the rational

actor paradigm (Adams, 1995; Dietz et al., 2002; Renn, 1992). It has a considerable implications for accounting, especially since accounting texts are usually coupled with the image that purposive individuals search for accurate and complete information so as to make 'rational' decisions including acting rationally on risk decisions (Miller & O'Leary, 1990). Nonetheless, economic rationality is questionable in the face of uncertain conditions (Power, 2007). Indeed, as Miller (1994, p. 18) indicates, organizations and individuals "might not conform to the idealized and naive models of rational behaviour" and are more likely to be "constrained" and "uncertain" about preferences, especially under uncertainty. Therefore, as a "logical consequence" of a 'rational' cost and benefit analysis, uncertainty that "cannot be valued in an acceptable fashion" is "ignored and therefore does not form part of this analysis" (Bebbington & Thomson, 2007, p. 44).

4.2.1 A psychological perspective of risk

The rationality of a techno-economic risk analysis has also been explicitly challenged in studies regarding perceptions of risk perceptions (Kasperson, 1992; Lupton, 1999; Power, 2007). Combining risk perceptions with behavioural decision theory, a psychological perspective of risk has shed light on the controversial and conflicting phenomena of risk management in society. It provides insights to identify the differences and similarities among a group's responses to risk events and found a systematic and predictable linkage between perceived and acceptable risk (Sovic, 1992). For example, an experts' judgement of risk is highly correlated with technical estimations while judgements from laypeople bear other contextual features (Renn, 1992).

The psychological approach to risk analysis expands the subjective notion of risk judgment in three ways (Sovic, 1992). First, it attempts to explain the divergence of public perception from expert assessment by focusing on the individual preference for probabilities and magnitude of risk (Renn, 1992). Second, it analyses individuals' intuitive processing under uncertainty (Krimsky, 1992; Renn, 1992) and has uncovered judgmental biases in individual capability to estimate probability. These biases, referred to as 'heuristics', are certain discernible rules applied to simplify complex problems (e.g. complicated risk information) when facing potential hazardous conditions (Krimsky, 1992; Renn, 1992). Third, it identifies a number of

risk attributes as contextual variables that influence an individuals' risk perception (Krimsky, 1992). These attributes include: acceptability (Lupton, 1999), voluntary, involuntary (Krimsky, 1992), familiarity, equity, controllability, catastrophic potential (Sovic, 1992) and expected fatalities or losses (Renn, 1992).

The psychology of risk reveals that public ideas about safety and risks are complicated "social constructions subject to processes of framing" (Power, 2007, p. 15) and therefore cannot be reduced to techno-economic risk assessment in the form of consequences and probabilities, or cost-benefit analyses (Renn, 1992). However, it is still an "ahistorical and non-contextual" approach despite the "strong intuitive and phenomenological grounding" (Krimsky, 1992, p. 18). According to Lupton (1999), psychological risk analyses are established in rational behaviour theory to resemble an economic notion of risk. It is assumed that, through the design of a survey instrument, subjective factors influencing personal perception and their relationships can be quantified, modelled and tested in order to predict individual and societal responses to potential hazards (Sovic, 1992). In this approach, the nature of risk itself is taken-for-granted and the research emphasises "[p]eople's responses to the objects, not the objects themselves" (Hilgartner, 1992, p. 41).

These limitations of a psychological risk perspective highlight the need for a socio-cultural inquiry (Dietz et al., 2002). For example, Douglas and Wildavsky (1982) argue that individuals' risk attitudes and beliefs are ascribed to a broader cultural frame. Therefore, a cultural perspective of risk is deemed as more appropriate to explain how risk is selected, framed and presented by organizational dynamics (Dietz et al., 2002; Douglas & Wildavsky, 1982; Power, 2007). This perspective also underpins the theoretical framework for this study. Before discussing a cultural perspective of risk, the general social constructivist view of risk is presented, with examples of two other constructivist branches, namely a sociological perspective and a governmentality perspective of risk.

4.3 **Social construction of risk**

Those who adopt a social constructivist viewpoint deem risk to be a sociocultural construct that cannot ever be fully objective as it is bound with historical, social, cultural and political contexts (Lupton, 1999; Renn, 1992). Social constructionists

believe that the social, material world and humans are in a dialectical relationship in which one creates the other. Social reality, although appearing to be objective and pre-existing, involves actors' subjective interpretations and the production and reproduction of definition and knowledge via socialization, social interaction and a reliance upon shared meaning (Chua, 1986a; Lupton, 1999). Meanings are "emergent", "subjectively created" and only "objectified through human interaction" (Chua, 1986a, p. 615). Scientific knowledge, like any other knowledge, is not constituted outside belief-systems or moral stances, but rather it is value-laden (Lupton, 1999). Risk therefore is not an objective or static phenomenon, but is continually "constructed and negotiated as part of the network of social interaction... [and] its meanings are precarious and subject to change" (Lupton, 1999, p. 29).

For research into risk as phenomena, social constructionists focus on how it is identified, labelled and dealt with through sociocultural patterns and changing patterns of risk perception both spatially and temporally (Lupton, 1999). Accordingly, the notion of risk exists as a worldview that informs "assemblages of meanings, logics and beliefs cohering around material phenomena, giving these phenomena form and substance" (Lupton, 1999, p. 30). The corresponding risk management activities are planned to reflect life style preference and social value (Renn, 1992).

There are many perspectives within this sociocultural dimension, yet they can be loosely grouped into three categories: a sociological perspective, a governmentality perspective, and a cultural perspective (Lupton, 1999). The following sections briefly introduce each perspective with its implications for accounting.

4.3.1 A sociological perspective of risk

All sociological concepts of risk share the common notion that human beings never look at the world with "pristine eyes" (Renn, 1992, p. 67). Risk events, as such, are understood and negotiated through human values and interests (Kasperson, 1992; Lupton, 1999). Probabilities and consequences of hazards are socially defined, constructed, and to a considerable degree, subject to human interventions, social processes and technological developments (Kasperson, 1992; Renn, 1992). Thus even though the cause of hazards may not necessarily derive from human conduct,

risk control and management is essentially founded in social institutions and interactions (Kasperson, 1992; Renn, 1992).

The German sociologist Ulrich Beck has been predominant in sociological studies of risk. His work, for example Risk Society Towards a New Modernity (Beck, 1992b), Reflexive Modernization (1994), The Normal Chaos of Love (1995), and Ecological Politics in the Age of Risk (1995) are predominantly concerned with the macro-level process of contemporary risk meaning and strategy and its relationship to what he perceives as the unique features of the current post-industrial society[29] (Lupton, 1999).

Beck (1992a, 1992b, 1994, 1995) asserts that the transformation of Western societies from the pre-modern/industrial to the post-modern/industrial era has had a significant impact on the concept of risk due to the process of industrialisation. Conventional industrial society is perceived as a 'Risk Society', whereby mass production and consumption are accompanied by risks which have flourished as a result of modernisation (Lupton, 1999). As such, the fundamental difference identified by Beck between industrial/modern society and contemporary post-industrial/modern society is that, whereas the former is concerned with distributing 'goods', the latter is concerned with distributing 'bads'. Previously, these might have been considered as "latent and controllable 'side effects'" (Reddy, 1996, p. 245), however, now are hazards which are deemed as "intrinsic, irreversible and uncontrollable" (Reddy, 1996, p. 245). These risks, principally environmental, such as air and water pollution and nuclear radiation, differ markedly from those in previous epochs or other societies, in that they have confronted human health and life "on a unprecedented scale" with long-term effects (Lupton, 1999, p. 62). In addition, these risks are

> neither visible nor perceptible to the victims... [and] require the sensory organs of science, theories, experiments, measuring instruments in order to become visible or interpretable as hazards at all (Beck, 1992b, p. 27).

From the aforementioned, science is understood by Beck as a key player in "the creation and multiplication of these risks" (Bebbington & Thomson, 2007, p. 47). This has a significant implication for accounting. Although one of the primary goals

[29] As 'Risk Society' is not chosen as the theoretical framework for this thesis, but rather a relevant component for methodology, this section only outlines some relevant themes, focusing on its implication for accounting research.

of accounting is to enable complex, contingent and intangible risks to emerge and become amendable through management processes, it is argued that accountancy professions and accounting systems are incapable of illuminating risks from industrialisation, let alone managing them (Bebbington & Thomson, 2007; Reddy, 1996). Indeed, mainstream accounting measurement, calculation and valuation are problematic and implicated in the production, proliferation and dissemination of these risks (Bebbington & Thomson, 2007; Reddy, 1996). For example, accounting can be used as a system to legitimate the effects of business-related environmental harms or hazards (Bebbington & Thomson, 2007). In the absence of an environmental cost or a social liability, accounting practice is usually taken to represent the "objective absence" of this externality (Bebbington & Thomson, 2007, p. 48). Accounting is reduced to "technical objective and apolitical means of quantifying the world out here" (Saravanamuthu, 2009, p. 164).

According to Beck (1992b), in a post-industrial/modern society, anxieties arising from risk introduced by industrialisation or modernisation call into question established beliefs in scientific enterprise and current practices in authoritative calculation (Lupton, 1999; Reddy, 1996). Individuals no longer see modernity and science as a key to civilization and progress, but tend to challenge the fundamental assumptions of this period (Lupton, 1999). This is called 'reflexive modernity', which is characterised by "a negotiation of knowledge claims between science, political interests, and laypersons - in effect, negotiation between different epistemologies" (Dietz et al., 2002, p. 346). It highlights the need for "a more accessible and democratic discourse concerning human needs and divergent human perceptions [than the mere] calculating approaches to knowing the future" (Reddy, 1996, p. 248). In the same vein, if accountants and accounting practices are about to capture environmental and social risks fully, make them visible and amenable to management, current social and environmental accounting technologies must provide a basis for stakeholder engagement to allow a new form of accountability (Bebbington & Thomson, 2007).

There are a number of accounting studies conducted in this area. Georgakopoulos and Thomson (2005) for example, interview relevant stakeholders including producers, consumers and regulators in the Scottish Salmon farming industry, and

explore their competing risk perceptions, discourses, and reasons for the absence of social and environmental accounting and reporting practices. They suggest that social and environmental accounting should reflexively engage stakeholders, for example, in a dialogical approach (Thomson & Bebbington, 2005) at all levels in order to improve democratic accountability. Saravanamuthu (2009, p. 121), on the other hand, constructs "a risk-based accountability mechanism" by combining Beck's theory of 'Risk Society', Luhmann's sociological theory of risk and Gandhi's vehicle of communicative action to "facilitate reflexive communicative action" (see also Saravanamuthu, Lehman & Nyamori, 2012).

To sum up, Beck's 'Risk Society' is concerned with individuals' emerging consciousness of shared risk arising from the industrial society where science has played a dominant role in "externalising and objectifying social form" (Reddy, 1996, p. 247). The potential of democratic engagement and discourse is to at least mitigate the "innumerable", "uncircumscribable" and therefore "radically unpredictable" effect of risks (Reddy, 1996, p. 244). Beck's epistemological position is labelled as 'weak' social constructivism by Lupton (1999)[30] because the risk phenomena in 'Risk Society' are;

> based on objective facts about dangers and hazards amenable to rationalistic calculation, which are then mediated, perceived and responded to in particular ways via social, cultural and political processes (Lupton, 1999, p. 28).

This thesis, rather than looking at accounting's potential to objectify environmental and social danger and harm, focuses on the socially constructed nature of GAB water related risk and the role of accounting and disclosures within this construction process.

4.3.2 A Governmentality/Foucauldian perspective or risk

A governmentality perspective on risk investigates how risk is conceptualised and operated in postmodern society and, is especially related to discipline, surveillance and regulation exerted by governments upon the population (Lupton, 1999). Drawing on Michel Foucault's insights on 'Governmentality', modernity and self-

[30] Lupton (1999, p. 26) also categorises the 'risk society' thesis as a critical structuralist approach. A critical structuralist approach, as she contends, "builds on the Marxist critical legacy to focus more on social conflict, inequities and dissent and the need for social change in relation to risk. Critical structuralists tend to be interested in critiquing the ways in which social institutions (such as government, the economic system and the legal system) wield power over individuals, reducing their capacity for agency and autonomy."

information, 'Governmentality' theorists focus on risk strategies and discourses as the political echoes of neo-liberalism and explore how they order the material and social world to render uncertainty and disorder controllable (Lupton, 1999).[31] Therefore, 'Governmentality' is a strategy and rationale to social regulation and control in contemporary western societies is centred on neo-liberalism and political rule "which champion individual freedom and rights against the excessive intervention of the state" (Lupton, 1999, p. 86).

Like Beck, the role of science and expert knowledge is emphasised by Foucault with regard to the phenomena of risk construction in post modernity (Lupton, 1999). However, instead of a transparent means of reflexive engagement for individuals, science and expert knowledge is viewed as a key to social administration to provide advice and guidance concerning risk governance and prevention to the government (Lupton, 1999).This mode of surveillance, or detecting and monitoring risks in the wider population, is based on the computing technology of normalization where statistic probabilities and correlations identify the norms of social behaviour within certain groups or the overall population (Lupton, 1999). As such, risk is problematised, calculated (e.g. categorising marginalised individuals risk or groups) and governed through external regulation and intervention (Lupton, 1999).

Apart from these directly enforced strategies, a contemporary 'Governmentality' approach also involves 'indirect strategies' which rely on individual autonomy through self-regulation (Lupton, 1999). Aligned with the neo-liberal goals and interests of the state, it is the most crucial aspect of 'Governmentality' to promote voluntary compliance and self-discipline of the population in order to minimize external intervention (Lupton, 1999). Accounting is understood as such an indirect means through which the conduct of individuals can be governed (Miller, 1994). Indeed, accounting systems and practices in a liberal democratic society are deemed as a mode "of governing economic life" (Miller & O'Leary, 1994, p. 111). According to Miller (1994, p. 29);

[31] 'Governmentality'/Foucauldian approach to risk adopts a poststructuralist perspective on power relations. Unlike functional structuralism, exponents of poststructuralism emphasize less on the rigid and static definition of structure, and more on the aspects such as change of meaning and flux in social structure and organization (Lupton, 1999). Individuals are seen as continuously shifting among different cultural and social identity, equipped with combination of power and knowledge. Power is not simply viewed as oppressive and coercive, but manipulated through manifold sites, as both productive and inescapable in any social networks and relations (Lupton, 1999).

> [in] so far as such societies mark out the economy as a distinct sphere with its own laws and regularities, and make the individual a fundamental locus of responsibility, accounting has a central place.

By focusing on performance evaluation, accounting techniques provide a particular way of "exert[ing] a positive influence" (Foucault & Hurley, 1981, p. 137) on individual actions to "remedy deficits on rationality and responsibility" (Miller, 1994, p. 29). This system of governmentality has been made possible by resorting to a neutral and objective "single figure" which is a final result from diverse technologies of calculation (Miller, 1994, p. 29). For example, standard costing and budgeting play a principal role in the attempt to make individual performance visible and calculable in terms of normative financial standards (Miller & O'Leary, 1987). The analysis of accounting as a governing practice is not only restricted to an organisational level, but extends to a national level. Knights and Vurdubakis (1993, p. 729), for instance, examine the "interdependencies between politics and forms of calculation" through the lens of life insurance. They argue that the "construction of risk as the object" in life insurance, along with calculative accounting techniques, are used as "moral and political" strategies by liberal governments to direct, coordinate and manage social life (Knights & Vurdubakis, 1993, p. 729). As such, accounting is regarded as pivotal "in creating and sustaining control of capitalistic activities... [It consequently] enable[s] organisation and governance frameworks to have a global reach" (Bebbington & Thomson, 2007, p. 45).

In sum, 'Governmentality' highlights modern strategies and discourses which bring risk into being and link this risk concept to an idea of how people should conduct their life through self-control and management. This approach reflects the neo-liberal objectives of institutional governments (Lupton, 1999). A 'Governmentality' approach adopts a 'strong' version of social constructivist and relativist positions (Lupton, 1999). The intensification of risk discussion and management is a result of the social change associated with modernization (Lupton, 1999). This concept of risk is highly political and constitutes a particular norm of behaviour and basis for action by which individuals are organised and regulated (Lupton, 1999).

For Foucauldian scholars, the physical nature of risk is not at the centre of an analysis (Lupton, 1999). As Ewald (1991, p. 199) indicates;

> [n]othing is a risk in itself, there is no risk in reality. But on the other hand, anything can be a risk; it all depends on how one analyses the danger, considers the event.

Although this thesis is concerned with the social construction of risk as an object, it does not focus on the governing process to promote voluntary compliance and self-monitoring of individuals, organisations or industries (Lupton, 1999). Instead, this thesis investigates the constructed GAB water related risk phenomena from a cultural perspective, which is explicated in the next section.

4.3.3 A cultural perspective of risk

Whereas sociological and governmentality perspectives link risk perceptions, responses and strategies to social values and interests, a cultural analysis proposes that these social values are determined by different cultural patterns and principles (Krimsky, 1992; Lupton, 1999; Rayner, 1992; Renn, 1992). In other words, individuals' risk perception and awareness cannot be made intelligible without reference to "cultural and political domains", which are "potentially fraught with conflict between points of view" (Reddy, 1996, p. 239). This cultural divergence in risk consciousness has resulted in an emphasis on different risks (Krimsky & Golding, 1991) which either reinforce social cohesion or support a particular life-style (Kasperson, 1992; Rayner, 1992; Thompson, Ellis & Wildavsky, 1990).

It is important to note that a cultural perspective, unlike a psychological analysis, assumes a (proactive) organisation or institution, rather than an individual, since individuals "affiliate with organizations that resonate with their values" (Dietz et al., 2002, p. 346). Risk is inherently a social construction and a cultural choice according to imperatives of an organisation (Reddy, 1996). Therefore, a cultural risk perspective combines elements of various methodologies, from both positive and normative risk disciplines, in a single approach.

From a cultural approach, risk awareness and tolerance can never be elucidated merely by a technical risk assessment because it is not a value-free exercise (Reddy, 1996). Although engineers and statesmen are said to obtain "objective" facts from tools such as risk analysis, "the figures about probabilities that are put into the calculation reflect the assigner's confidence that the events are likely to occur" (Douglas & Wildavsky, 1982, p. 71). In the case of Environmental Impact

Assessments (EIA) and Environmental Impact Statements (EIS)[32], for example, despite their official objectives of "identify[ing] the possible risks to the environment from project proposals" (Harding, 1998, p. 134), do not "necessarily guarantee scientific validity" (Harding, 1998, p. 142). Based on previous experience, those who conduct or commission the EIS - often proponents of the project, usually "formulate EISs so that their proposal is seen in a more favourable light" by highlighting advantages and trivialising disadvantages (e.g. any adverse effects to the environment associated with their proposal) (Harding, 1998, p. 142). In this thesis, BHP's EIS related to Olympic Dam Expansion Project (ODEP) is found to be similarly biased, as BHP's interests, including extracting more water from GAB, differ significantly from the interests of civil society.

The rejection of a 'science versus value' dichotomy is also reflected in a cultural viewpoint of standard-setting processes (Krimsky & Golding, 1991). According to Weinberg (1981, p. 5):

> Even when the risk can be quantified, the setting of standards is intrinsically a political act. That is the standards themselves must in the final analysis be arbitrary.

As such, public environmental decisions or policies, no matter how neutral or scientific the relevant risk assessment, are essentially derived from a social process involving the creation of a shared meaning among communities and relations of trust (Krimsky & Golding, 1991; Rayner, 1992). Water accounting standard-setting, for example, needs consensus from the key stakeholder groups such as water suppliers, water recipients and regulatory bodies (Egan & Frost, 2010). As well, environmental decisions from the Australian Federal and South Australian governments regarding the charging of a fee or levy for BHP for GAB water extraction required an agreement among major stakeholders including BHP, local community, and governmental agencies. As Krimsky and Golding (1991, p. 110) assert, decision-making processes may also reflect "the ebbs and flows of any political debate".

[32] According to Harding (1998, p. 134), "[t]he EIA process enables consideration of environmental factors alongside traditional consideration such as economic and technical aspects of a development proposal". As "a key document or step in the framework of an [EIA], an [EIS] ... is the document which details the case for a particular development, the state of the environment in which the proposal is to be located, likely environmental impacts of the proposal, the alternative operations, potential safeguard, management and monitoring" (Harding, 1998, p. 138).

As described previously, a cultural perspective views risk as a social construct and emphasises the cultural patterns and belief systems through which risk knowledge is mediated (Lupton, 1999). This approach demonstrates a stronger constructivist view than the 'Risk Society' thesis (4.3.1) and a weaker constructivist view than 'Governmental' thesis (Lupton, 1999) (4.3.2), as it acknowledges that real danger, or risk, exists in the world, but its major arguments are concerned with how risk is "politicalized" (Douglas, 1992, p. 29). Additionally, a cultural perspective of risk is indicative of a functional structuralist approach as it focuses on the attitudes or convictions of social aggregates and analyses their risk selection to address how to mitigate social deviance and strengthen social order (Lupton, 1999).

In this thesis, a cultural risk perspective is harnessed as a transdisciplinary means to address conflictual and oppositional socio-cultural expectations and values (Horlick-Jones & Sime, 2004; Sampford, 2009). It facilitates public engagement and democratic participation in a communicative and dialogic effort among the regime of polylogic water governance against the backdrop of water scarcity. The next section briefly explains the interrelationship between several related themes including risk management, risk object, accounting and hybrids, from a cultural perspective of risk.

4.4 A cultural perspective of risk for critical accounting research

It is argued by a number of critical accounting researchers that contemporary risk management practices, with their aim of 'taming' incalculable uncertainty into calculable therefore manageable risks, have become "almost synonymous with ideals of good management" (Miller et al., 2008, p. 43; see also Power, 2007). What cannot be overlooked here is the "institutional rationality" that underpins the management of risk (Moerman & van der Laan, 2012, p. 111).

According to Power (2007, p. 5), the separation of risk from uncertainty implies a social expectation for "decidability" and "actionability" about the future, and constructs a new area of responsibility and accountability. As such, uncertainty becomes risk when it is expected to be manageable. There is a need, both "functional and political ... to maintain perception of control and manageability" (Power, 2007, p. 5). Therefore, whether all risks are able to be managed is not the core issue. As Douglas and Wildavsky (1982, p. 1) assert: "[c]an we know the risks we face, now

or in the future? No we cannot, but yes we must act as if we do" - for that reason, organisations "must be seen to act as if the management of risk is possible" (Power, 2007, p. 6). Risk management, therefore, has turned into a major strategy of corporations for managing risks for themselves (Miller et al., 2008; Moerman & van der Laan, 2012).

It is important to understand the role of accounting in risk management and the important notion of hybrids. According to Miller et al. (2008), risk management is a set of practices that are prevalent in both private and public sector organisations. In spite of its different manifestations in varied fields, risk management generally can be considered as "an overlapping family" of measuring and calculating methods for risk that is rooted in statistics (Power, 2007, p. 13). A further investigation of risk management reveals a broad range of 'hybrids' (Miller et al., 2008; Power, 2007) which are defined by Miller et al. (2008, p. 943) as "new phenomena produced out of two or more elements normally found separately". Such cases can be exemplified by accounting, as accounting techniques, practices and expertise have largely drawn from other domains and disciplines (Miller, 1994; Miller et al., 2008). Management accounting, for example, has drawn its calculative contents from disciplines such as economics and engineering, including discounted cash flow, fixed and variable costs and standard costing (Miller et al., 2008). Moreover, not only have the core calculative practices of accounting, but also its rationales, have been adopted from elsewhere, e.g. science and economics, for other purposes (Miller, 1994, 1998; Miller et al., 2008). According to Miller (1994, p. 3),

> [t]he term rationales can be used to designate this aspect of accounting as a social and institutional practice ... it is these rationales ... that mobilize the calculative technologies of accounting.

The hybridisation of accounting is accompanied by the inter-organisational and intra-organisational coordination and cooperation in which sharing expertise and transferring inter-professional knowledge often result in the creation of "new bodies of expertise" and the emergence of the "novel metric" (Miller et al., 2008, p. 962; Moerman & van der Laan, 2012). It is through these hybridising processes, practices and expertise, that "discrete elements get mixed up to form something new", and it is

through this "newly formed object" that managing risk is made possible (Miller et al., 2008, p. 952; Moerman & van der Laan, 2012).

Indeed, the power of the hybridised accounting technique lies in its role as a 'boundary object' (Miller et al., 2008; Moerman & van der Laan, 2012; Power, 2005; Power, 2007). Bowker and Star (1999, p. 297) note that:

> Boundary objects are those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain common identify across sites.

By uniting disparate concerns and interests from diverse domains, accounting can be seen a "boundary-spanning activity" (Miller et al., 2008, p. 943) that facilitates the collaboration of multiple "interest groups and potential allies" (Power, 2007, p. 27) and makes the future uncertainty "calculable and manageable" (Moerman & van der Laan, 2012, p. 107). Miller and O'Leary (2007) for example, identify the microprocessor industry's road-mapping practices and Moore's Law, as hybrids and boundary objects from disciplines of finance and scientific technology that help to minimise risk by affiliating expectations among different firms. In a study of Finnish health care reforms, Kurunmäki (2004) suggests that the hybridisation between medical, financial and accounting expertise across organizational boundaries reduced the uncertainty arising from a new system of resource allocation. Moerman and van der Laan (2012, p. 107) examine how the hybridised accounting calculative technology was able to "manage, mediate, and facilitate the socialization of risk" in the context of liabilities arising from asbestos-related disease and compensation funding.

In this thesis, GAB water related regulations and (accounting disclosure) practices from BHP OD and governments differ from classic financial accounting (disclosure) due to the multiple dimensions it embraces, such as economic, environmental and social (Chalmers et al., 2010; Plummer & Tower, 2010). Therefore, it can be understood as a hybrid form of techniques and practices, which falls between disciplines including engineering, accounting, environmental science and physics, economics and law (Plummer & Tower, 2010). Combining these different bodies of expertise and interests, water accounts/disclosures can also be considered as a

boundary object which is expected by BHP OD and governments to identify and measure water input, output, and usage in order to facilitate the decision making of allocation of scare water resources and consequently reduce water-related risks (Chalmers et al., 2010; Plummer & Tower, 2010).

Apart from the investigation of the water risk regulations and management from BHP OD and governments, this thesis also analyses counter (accounting) disclosures from civil society, which challenge BHP OD and governments' risk management with their construction of GAB water-related risk and the corresponding risk management.

Risk is not understood as 'real' property in the world, therefore, risk management is underpinned by various logics and values (Krimsky & Golding, 1991). The focus of this thesis is on the social, cultural and institutional frames that shape our understanding and management strategies of risk (Power, 2007). Since most research with a techno-economic emphasis has treated risk as an object and comparatively unproblematic, there is a lack of attention and effort to examine the socio-cultural process whereby 'risk objects' are constructed (Hilgartner, 1992; Power, 2007). Risk objects are defined by Hilgartner (1992, p.41) as "things that pose hazards the source of danger, the entities to which harmful consequences are conceptually attached". For example, in the phrase 'the risk of smoking', 'smoking' is the risk object. A simplified process of risk object construction involves making the linkage of harm to an object and defining it (Hilgartner, 1992; Power, 2007). According to Hilgartner (1992, p. 46),

> [t]his task is a rhetorical process, performed in texts that are displayed in specialized organisations or in public arenas, and it usually involves building networks of risk objects.

These socio-technical networks consist of experts, resources, organisations and regulations through which particular risk control activities are constructed (Power, 2007). The task of building networks is often complex and the social and political

struggles over the control of a risk object are pervasive, generally through strategies of emplacing and displacing the risk object[33].

According to Power (2007, p. 26), "[a] focus on the sociotechnical networks which support, or destroy, risk objects requires definitions of risk to be endogenized, rather than treated abstractly". The definition of risk-related concepts therefore is socially constructed, and any change in the definition could result in the redistribution of responsibility for risk, relocation in scope or decision making and a redetermination of an actor's rights and obligations in dealing with danger or hazards (Hilgartner, 1992). Linsley and Shrives (2014), for example, utilise cultural risk theory to analyse comments letters associated with the Financial Reporting Council's (FRC) 'complexity of corporate reporting' discussion paper. They identify three sets of institutional perceptions and constructions of risk - related issues with respect to the free market, regulation, the priority of stakeholder groups, justice and ethical actions. Each institution seeks to persuade others about the validity of their preferred way of life.

This thesis concentrates on the "dynamics" of BHP OD's GAB water extraction as the risk object in "organizing definitions and descriptions of a practice and its constituent elements" (Power, 2007, p. 26). It investigates the socio-cultural constructed nature of the debate arising from the GAB water related risk, by emphasising the different institutional views on risk and sustainability related concepts, and their corresponding normative ideals of risk resolution. As risk management crucially depends on "management systems of representations ... [and] instruments for framing objects for the purpose of action and intervention" (Power, 2007, p. 4), this thesis analyses "the manner in which [GAB water risks] are presented and constructed" (Power, 2007, p. 8) through contested disclosure documents from BHP, governments and civil society.

4.5 **Summary**

This chapter discussed the methodological issues of risk research and the application for accounting studies. Positivist research with a techno-economic focus has viewed

[33] Hilgartner (1992, p. 48) notes that "construction risk objects is a two-way process, propelled by efforts to emplace risk objects within, and displace them from, sociotechnical networks." Emplacement can be conducted through "construction" of risk objects or "resistance to control"; displacement can be conducted through "deconstruction" or "control".

risk as an object and is insufficient to understand the entire risk profile related to water resource issues (Baleta, 2012; Horlick-Jones & Sime, 2004). This thesis adopts a cultural risk perspective as a transdisciplinary approach to investigate different institutional positions towards the GAB water related social and environmental risks manifest in disclosure documents. It emphasises the culturally constructed nature of this debate on risk-based sustainability related concepts to facilitate public engagement and participation for the complex problem of water governance. The next chapter presents the research method to analyse the GAB water-related disclosure from BHP, governments and civil society.

CHAPTER 5 METHOD

5.1 Introduction

The previous chapter discussed methodological issues in risk studies and their implications for accounting research. A cultural perspective of risk was presented as the appropriate methodology to examine different institutional stances towards the Great Artesian Basin (GAB) water related economic, social and environmental risks in contested water disclosures. This thesis adopts cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) as a theoretical framework (Chapter 6). According to the framework, two relatively stable centre institutions (market made up of individualistic solidarity, and hierarchy made up of hierarchical solidarity) and border (made up of sectarian/egalitarian solidarity) institutions exist and for this thesis these are: the market (BHP Billiton (BHP) and BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD)), hierarchy (Australian Federal government and South Australian government) and border institutions (Non-Government Organisations (NGOs), environmental activists and Aboriginal groups). Contrary to the usual practice of presenting the theoretical frame first, this chapter explicates the research method used to examine how the GAB water risk debate is manifest through cultural practices. It is through this method that the various notions of risk-based sustainability from cultural risk theory are identified and (re)structured (Chapter 6, Section 6.3) to further enable the interpretations of contested institutional discourses.

This thesis employs a critical accounting approach to acknowledge divergent ideologies and interests among different stakeholder groups to promote democratic participation through genuine 'dialogue'. It explores the GAB water risk debate from BHP OD's water extraction by compiling and analysing corporate sustainability reports and other public statements; government regulatory documents; and alternative public disclosures obtained from civil society. It examines whether the ideology or value system inscribed in corporate water disclosures is aligned with and/or differs from the governmental regulatory disclosures and how it is resisted and challenged by the NGOs, environmental activists and Aboriginal groups.

Consistent with a social constructivist ontology and epistemology, this thesis performs a discourse analysis approach to collate and analyse accounting

disclosures/accounts for the GAB water debate. It investigates discourses within documents issued by BHP OD, governments and civil society through a textual approach termed "interpretive structuralism" (Phillips & Hardy, 2002, p. 24). An interpretive structuralist approach is primarily concerned with how social and cultural meanings are constructed through discourses and texts. In this study, the particular emphasis is on rhetoric. Rhetoric is a technique of using discourse for persuasive effect, and this study examines how rhetoric is used by three institutions as a strategic resource.

To interrogate institutional documents, Burkean rhetorical criticism (Stillar, 1998) is adopted as a specific method. While rhetorical criticism is considered as a relatively broad interpretive tool to discover how people 'particularise' social situations with the attempt to influence others through language (Gill & Whedbee, 1997; Selzer, 2004), Burkean rhetorical criticism is a specific method with an assumption that rhetoric is one of the symbols used to constitute the world, give it meaning and express common interests required for achieving social unity (Burke, 1950, 1966, 1969).

Burkean rhetorical criticism incorporates three levels of analysis - grammar, rhetoric and logology (Stillar, 1998). The grammatical analysis focuses on texts within the documents issued by institutions and the rhetorical situation from which the production of those texts arise. Rhetorical analysis deals with how the public, as audiences, are invited by each institution to share and believe in different risk assumptions regarding GAB water related risks. Logology analysis is concerned with social conditions and the consequences of "terministic screens" (Burke, 1966, p. 50). In different institutions, texts and discourses function to condense GAB water related risks by highlighting certain aspects for public attention and engagement.

This chapter begins with an overview of a critical accounting approach (Section 5.2), discourse (Section 5.3) discourse in documents (Section 5.4), and text and textual analysis (Section 5.5) with reference to an interpretive structuralist approach. This is followed by a general discussion of rhetoric (Section 5.6) and rhetorical criticism (Section 5.7). A Burkean perspective of rhetorical criticism (Section 5.7.1) is subsequently discussed, with a particular emphasis on grammatical, rhetorical and

logological analyses. The documents used as data in this study are then presented (Section 5.8) before a final description of the process of data analysis (Section 5.9).

5.2 A critical accounting approach

As explicated in Chapter 3, this thesis adopts a (critical) counter-accounting approach to explicitly acknowledge divergent interests and engage ideological contestations among different stakeholder groups in order to engender/foster genuine dialogue and democratic participation for promoting progressive and emancipatory change (Brown, 2009; Brown & Dillard, 2013; Dey et al., 2011; Gallhofer et al., 2006).

Analysing 'polylogic' accounting reports are argued to facilitate the shift of the narrow form of accountability from an organisationally or institutionally centred framework to a more encompassing and democratic form of accountability (Brown & Dillard, 2013; O'Dwyer, 2004); offer opportunities for an open dialogue among company and its heterogeneous stakeholders (Dey, 2003); and present emancipatory potential in fostering "counterhegemonic" (Brown & Dillard, 2013, p. 15).

This thesis explores the GAB water risk debate from BHP OD's water extraction by compiling corporate sustainability reports and other public statements; government regulatory documents; and alternative public disclosures obtained from civil society. It investigates whether the ideology or value system inscribed in corporate water disclosures is aligned with and/or differs from the governmental regulatory disclosures and how it is resisted and challenged by the NGOs, environmental activists and Aboriginal groups. This thesis therefore is in line with a genre of studies termed 'counter accounting' that problematises and destabilises the normalised nature and taken-for granted assumptions of business and sometimes government (Dey et al., 2011). As a result, it facilitates the articulation of and reflection upon different styles of accountability from the perspective of industry, government and civil society (Buhr, 2001; Rodrigue, 2014). It therefore echoes the call for a dialogical approach to accounting which enables democratic participation (Brown, 2009; Gray, 1992).

5.3 **Discourse**

This thesis performs a discourse analysis approach to collate and analyse accounts for the GAB water debate. Fairclough (2003, p. 2) describes language as "an irreducible part" of social life and it is "dialectically interconnected" with other elements in social life. Discourse is a linguistic term covering extended samples of spoken or written language. It emphasises the interaction between writer and reader or speaker and addressee, thus emphasising the production and interpretation processes of talk and text, as well as the situational context (Fairclough, 1992). While there are various definitions of discourse among the literature, the most common one refers to "the actual practices of talking and writing" (Phillips & Hardy, 2002, p. 3).

In social theory and social analysis, discourse is used widely to refer to "different ways of structuring areas of knowledge and social practice" (Fairclough, 2003, p. 3). This stance is attributed to Foucault's (1976, 1980 in Alvesson & Karreman, 2000) assumption that discourses constitute both subjects and objects, and arrange and naturalise the social world in a particular way to inform social practices. These practices construct specific forms of subjectivity to manage human subjects. These certain forms are considered as rational and self-evident (Alvesson & Karreman, 2000). Discourse, from this perspective, does not just represent or reflect social entities. Instead, it constitutes the foundation of a social construction process upon which social reality depends (Hardy & Phillips, 1999). In Fairclough and Wodak's (1997, p. 258) words, discourse does not simply mirror "reality", but rather constitutes "situations, objects of knowledge, and the social identities of and relations between people and groups of people".

It is important to note here that it is an intermediate version of social constructivism of discourse that this thesis takes. According to Fairclough (1992, p. 66),

> the discursive constitution of society does not emanate from a free play of ideas in people's heads but from a social practice which is firmly rooted in and oriented to real, material social structures.

In other words, although people may construe (e.g. represent and imagine) the social world in some particular way, whether such a construal or representation has an changing effect on textual construction of the social world, depends on other

contextual factors, such as "the way social reality already is, who is construing it, and so forth" (Fairclough, 2003, p. 9). Indeed, there are various orientations that social reality and social practice exhibit, such as economic, cultural, political and ideological. Discourse might be implicated in all the above dimensions "without any of them being reducible to discourse" (Fairclough, 1992, p. 66). As such, discourse is regarded as "a form of social practice" instead of merely a reflection of situational variables or an individual activity (Fairclough, 1992, p. 63).

There is an implied dialectical relationship between social practice and social structure (Fairclough, 1992). Generally speaking, the latter acts both as an effect of and a condition for the former. On one hand, discourse, as a form of social practice, is constrained and shaped by social structure in the broadest sense and at different levels. Depending on structural determination, discursive events vary in accordance with the particular institutional framework or social domain from which they are generated. On the other hand, discourse contributes to the construction of all the dimensions of social structure which constrains and shapes it directly and indirectly in terms of its own conventions and norms, as well as social identities, relations and institutions which underpin it (Fairclough, 1992). In this sense, discourse is a social practice "signifying the world, constituting and constructing the world in meaning" (Fairclough, 1992, p. 64).

While discourse is considered as a particular way of representing some area of the world or a possible world with projected change in some directions, there are often alternative and competing discourses, consistent with different social identities, positions and social relationships with others (Fairclough, 2003). These discourses differ in the representation of social events in terms of their inclusion or exclusion, the abstractness or concreteness, and the specification of social actors, their relations, time, space and processes of the events (Fairclough, 2003). Despite these differences, a particular discourse is always connected to other discourses which were produced earlier in the context, as well as those which are produced subsequently and synchronically (Fairclough & Wodak, 1997, p. 277).

In this thesis, discourse is considered as a mode of institutional and political practice. In accordance with a cultural risk methodology (Douglas & Wildavsky, 1982), both

competing and complementary discourses emanate out of interactions between BHP OD, governments and civil society around the water intake of BHP OD for Olympic Dam Expansion Project (ODEP). These discourses differ significantly in terms of their representations of several dimensions of this water issue, and they are related to different cultural and institutional risk perspectives regarding the relations people have to nature, and social relations (Fairclough, 2003).

5.4 **Discourse in documents**

This study uses documents issued by three institutions - market, hierarchy, and border as data sources to construct and analyse accounts which comprise three different sets of institutional discourses emerging from the GAB water debate. According to Sharp and Richardson (2001), documents are sources in which different discourses are manifest. Since documents are both nestled within and represent a set of discursive practices (Phillips & Hardy, 2002), documents are considered as situated products rather than fixed and stable artefacts (Prior, 2003).

According to Prior (2004, p. 376), each document enters "social interaction in a dual manner" as both "a receptacle of content" and "an functioning agent in its own right". It is the second function of documents, their mediation of social relationships that this study focuses upon. Documents define and specify things, classify events and describe processes. They also structure identity and circumstance, set boundaries of expertise and social networks, and make objects visible and therefore manageable (Prior, 2004).

As such, documents are not merely passive and inert items operated by human beings. Rather, they actively influence the actions of human agents (Prior, 2004). As Prior (2003, p. 2) asserts, documents should be considered in terms of "fields, frames and networks of action". The status of documents depends primarily on the way in which they are produced and consumed. It is also important to note that those who consume the documents are not just passive agents in the communicative process, but also active in the document production processes as well (Prior, 2003).

In this study, fields of networks involve market, hierarchy, and border institutions and the broad setting of the GAB water-related risks. These three realms are implicated in the discursive formations in all documents employed within accounts

emerging from the GAB water debate. The documents issued by market and hierarchy institutions are largely "recruited as allies" (Prior, 2003, p. 13) to support each other's actions (except in some special cases - for example, see Chapter 9), while border institutions tend to view these documents as "an enemy" (Prior, 2003, p. 3) that need to be challenged and transformed. This dynamic of production and consumption of various documents assimilates different risk perspectives into cultural and institutional water practices, which is "the key to understanding the process of [social] fabrication" (Prior, 2003, p. 10).

5.5 Text and textual analysis

Text is considered as one dimension of discourse, and the spoken and written product of the text production process (Fairclough, 1992). Apart from written texts and spoken words, the variety of textual forms also covers pictures, symbols, sounds and artefacts (Grant, Keenoy & Oswick, 1998; Kress, Leite-Garcia & van Leeuwen, 1997). Since discourses are both embodied and enacted in various texts, texts can be regarded as "a discursive 'unit' and a material manifestation of discourse" (Phillips & Hardy, 2002, p. 4). This thesis analyses textual discourses in documents.

According to Phillips and Hardy (2002), texts are the emergence site of the complexity of social meanings produced in a particular history. Texts record, in partial ways, the history of who participated in the production of the text and how the institutions were brought into play. In other words, texts name and arrange participants, processes and circumstances. They construct perspectival and temporal conditions through linguistic resources (Stillar, 1998). Texts, in this sense, are indeed "a partial history of the language and social system" arising from the structuring of relations between participants (Phillips & Hardy, 2002, p. 4). According to Fairclough (2003, p. 8), texts can be seen as "elements of social events" since one way for people to act and interact in social events is to write or speak.

When texts are approached as elements of social events, texts are concerned with an interactive process of meaning - making (Fairclough, 2003). As Phillips and Hardy (2002, p. 4) contend,

> [t]exts are not meaningful individually, it is only through their interconnection with other texts, the different discourses on which they draw, and the nature of their production, dissemination, and consumption that they are made meaningful.

There are various approaches to discourse analysis. Alvesson and Karreman (2000) for example, propose four versions centred on organisational studies from a micro-discourse approach to a mega-discourse approach. Micro-discourse approaches emphasise social texts to form a detailed study of language use in a specific micro-context. A meso-discourse approach, while relatively sensitive to texts, focuses more on the broader patterns and similar local contexts, beyond the details of texts. A grand discourse approach draws on an assembly of discourses which are ordered and presented as an integrated framework to constitute organisational reality. A mega-discourse approach is concerned with a universal connection of discourse material. It typically addresses somewhat standardised ways of constituting or referring to a certain type of phenomenon.

Phillips and Hardy (2002) also classify four main perspectives in respect of discourse analysis: interpretive structuralism; social linguistic analysis; critical discourse analysis; and, critical linguistic analysis based on a combination of text and context scale and constructivist and critical scale. Interpretive structuralism emphasises the understanding of the broader social and institutional context and its supported discourse. Instead of analysing individual texts on a micro-level, texts are collected and investigated with a primarily constructivist concern of how "discourse contexts come into being and the possibilities to which they give rise…without a direct concern with power" (Phillips & Hardy, 2002, p. 24). Social linguistic analysis is constructivist and based mainly on individual texts, only marginally referring to its context. The goal of this analysis is to understand how texts organise and construct social phenomena. Critical discourse analysis emphasises the role of discursive practice in constructing, legitimating and sustaining unequal power relations and analyses dialogical struggles in privileging one particular discourse and marginalising others. Critical linguistic analysis, like social linguistic analysis, focuses on individual texts. However, this analysis also entails a strong interest in power dynamics that surround the text. It shares the concern of critical discourse analysis but emphasises more the micro-dynamics of texts.

This thesis takes the interpretive structuralist approach to analyse discourse and text in documents with regards to the GAB water related risks. While it is concerned with ideological effects of each institutional discourse, it underscores a meso-level

analysis of institutional communications in their context, without necessarily analysing "the interplay between the text and the discursive context" referred by critical discourse analysis (Laine, 2009, p. 1049). As such, an interpretive structuralist approach can be considered as studying "discourse in text", where discourses have existence and coherence beyond the text (Sharp & Richardson, 2001, p. 195). This thesis thus does not intend to deconstruct texts in institutional documents from a linguistic perspective either. Instead, it examines different institutional accounts regarding the way how discourses of the GAB water debate are manifest in documents issued by BHP OD, governments and civil society.

The interpretive structuralist approach has been adopted by a number of accounting researchers in their studies of business discourse of sustainable development. Milne et al. (2009), for example, employ an interpretive structuralist analysis to critical examine both visual and textual (re)presentations of sustainable development from a New Zealand business association. They found that these business reports present "a pragmatic and middle-way discourse" characterised by a largely instrumental and utilitarian view of the natural environment (Milne, Tregidga & Walton, 2009, p. 1211). Such representations facilitate particular actions while constraining and silencing alternative perspectives. Tregidga and Milne (2006) investigate sustainability reporting from a New Zealand water utility, a leading reporter on social and environmental effects. Through interpretive structuralist analysis, the authors identify the organisation's evolving construction of itself from a sustainable resource manager to a sustainable development practitioner.

By deploying a similar 'interpretive textual analysis", Laine (2005, 2009, 2010) has conducted a genre of studies to critically assess the social constructed process of sustainable development through corporate disclosures in the context of Finnish listed companies. In one study (Laine, 2005, p. 402), sustainable development is constructed as "compatible and mutually reinforcing" with economic growth, which is attainable without the radical restructuration of the prevailing social order. In another studies (Laine, 2010, p. 247), the conceptualisation of sustainable development has transformed from "revolutionary" to "evolutionary" during 1987-2005 to sustain the status-quo. Corporate disclosure was also used as a rhetorical

device, reflective and adjusted to changing institutional pressures for legitimacy in society (Laine, 2009).

This thesis explores how discursive formations in the form of texts construct meanings of the GAB water risk related concept and how these concepts are utilised in the GAB water debate manifest in contested disclosures issued by different institutions. By doing so, it flushes out the alternative interpretation from civil society as a counterpoint to business entities and governments, and leads to the "possible radical edge" (Laine, 2005, p. 408) of sustainability and risk-based concepts in water accounting studies.

5.6 **Rhetoric**

In this study, different institutional documents can be understood as a bundle of exchanges that give shape to the GAB water debate through the strategic nature of their discourses. In other words, documents from each institution are considered as media involving rhetorical arguments through which each institution attempts to influence society at large through its position on the GAB water-related social and environmental issues.

Rhetoric is a method of persuasion, or the technique of using discourse for effect. It is normally "located on a political stage" (Gill & Whedbee, 1997, p. 157) where language, including metaphors, symbols, expressions have been consciously selected to (re)present a certain institution to other institutions and public in a particular light (Craig & Amernic, 2004; Lawrence & Suddaby, 2006; Livesey, 2001; Suddaby & Greenwood, 2005). As such, rhetoric is largely "instrumental" (Gill & Whedbee, 1997, p. 157) in "persuad[ing] others to change their attitudes, beliefs, values or actions" (Cheney, Christensen, Conrad & Lair, 2004, p. 79), and rhetoric more broadly emphasises the strategic function of language as a vehicle to shape both means and ends of human action (Green, 2004).

Rhetoric originates from education, philosophy and political systems of the ancient Greeks and Romans (Cockcroft & Cockcroft, 2005), and is inevitably involved in everyday communication and interaction (Hartelius & Browning, 2008). From an Aristotelian perspective, classical rhetoric is categorised by three unique but non-separable elements - ethos (credibility), pathos (emotion) and logos (reason) (Aho,

1985; Haskins, 2004). These three elements identify distinct dimensions of persuasive appeals and uncover the characteristics of good arguments (Holt & Macpherson, 2010).

According to Cheney, et al. (2004), rhetorical studies have emerged in different disciplines such as sociology, physics and economics. The principal symbols including metaphors, models and images in each case have been examined for their persuasive effects (Simons, 1990). In the same vein, accounting symbols are claimed to be essentially rhetorical by their nature and accounting terminology, calculative practices and narratives have been studied to reveal how they frame and convey particular understandings of the social and environmental realm, and therefore socially construct reality (Hines, 1988; Laine, 2005, 2009; Moerman & van der Laan, 2007; Tregidga & Milne, 2006; Walters-York, 1996).

This study goes beyond the rhetorical influence of an organisational or institutional rhetoric to encompass symbolic actions from three distinct but complementary institutions in respect of the GAB water risks. It analyses accounts in the form of institutional discourses as dialectical processes that link texts, institutional actors and rhetorical situations. In other words, this study investigates how different institutions utilise rhetoric to proactively frame and shape rhetorical situations or respond to such rhetorical situations.

Indeed, the strategic or political nature of institutional rhetoric is raised by Cockcroft and Cockcroft (2005), who draw on Michael Billig's (1996) *Arguing and Thinking* and assert that the value of rhetoric is embedded in dialogue, rather than a monologue, as it offers a typical model of human thinking. This is manifest in all levels of public discussions and debate throughout contemporary society, and serves to either avoid conflict or resolve conflicts after they arise (Brennan & Merkl-Davies, 2014; Cockcroft & Cockcroft, 2005). Consistent with cultural risk theory, this study views different discourses of market, hierarchy and border institutions manifest through documents as rhetorical by their very existence as they are disseminated to create and privilege different risk perspectives in the GAB water risk debate. In particular, centre (i.e. market and hierarchy) institutions' rhetoric comprises

arguments “implicitly, if not explicitly” (Cockcroft & Cockcroft, 2005, p.2) opposed by the border institutions’ counter arguments.

5.7 Rhetorical criticism

This study adopts rhetorical criticism as a broader approach to analyse rhetoric. Rhetorical criticism, in the modern era, is understood as an interpretive tool to discover and analyse how people ‘particularise’ social situations with the attempt to influence others’ understanding of the social fabric through language (Gill & Whedbee, 1997; Moerman & van der Laan, 2007; Peterson, 1997; Selzer, 2004). It requires us to identify, describe and dismantle textual structures to investigate how they shape understanding, privilege and silence particular interests (Gill & Whedbee, 1997).

Consistent with various approaches to discourse analysis, approaches to rhetorical criticism vary along a continuum between two extremes. At one level, analyses concentrate on texts more than contexts, while at the other end, context is the major focus rather than text (Selzer, 2004). The former approach emphasises significant features of a text, such as “structure and temporality, argument, metaphor and iconicity” (Gill & Whedbee, 1997, p. 17). This model of textual analysis, albeit involving a detailed discussion of instrumental operations of particular texts, is necessarily limited as the authors’ intentions, audiences’ response and any unintended consequences can only be speculated (Cheney et al., 2004; Moerman & van der Laan, 2007).

The latter approach as a model of contextual analysis focuses on a series of texts to create and recreate a thick description of “the social circumstances that call rhetorical events into being and that orchestrate the course of those events” (see also Cheney et al., 2004; Selzer, 2004, p. 292). Contextual analysts understand that social practices in general, and communications in particular, reflect attitudes and values of different communities. They seek to expose the intention and role of actors, their persuasive tactics and appeals for legitimacy, the power relations between them, and intended and unintended consequences (Cheney et al., 2004; Fairclough, 2003; Moerman & van der Laan, 2007; Selzer, 2004).

In accordance with most approaches to discourse analysis, rhetorical criticism is generally understood as both textual and contextual in nature, and most rhetorical analysts not only passively decode a particular text, but also actively understand the context from which the text arises (Gill & Whedbee, 1997; Moerman & van der Laan, 2007; Selzer, 2004; van Dijk, 1997). Since this study investigates how the GAB water risk debate between market, hierarchy and border institutions manifests in cultural practices and how this debate is conducted through various discourses in documents/accounts, a full appreciation of the interplay between context and text is required, especially as texts often embrace important clues about context (Selzer, 2004), and texts operate to name and rename the context (Gill & Whedbee, 1997).

5.7.1 Burkean rhetorical criticism

Kenneth Burke is an American literary philosopher and theorist who has had a significant impact in the disciplines of philosophy, linguistics, literature, sociology and economics throughout the twentieth century (Foss, Foss & Trapp, 2002; Toye, 2013). As a specialist in rhetoric theory and criticism, Burke deviated away from traditional notions of rhetoric and oriented his writing of language towards the social context. He recognises that language involves more than just logic and grammar, and the social context of language goes beyond the principles of pure reason (Hansen, 1996). Burke is best known for his idea of rhetoric as an art of persuasion (Foss et al., 2002). His principle works include *Permanence and Change* (Burke, 1984b), *Attitudes Toward History* (Burke, 1984a), *A Grammar of Motives* (Burke, 1969), *A Rhetoric of Motives* (Burke, 1950), and *Language as Symbolic Action* (Burke, 1966).

From a Burkean perspective, symbols are related to the material world dialectically. That is, symbols do not simply mirror the world. Instead, they constitute the world and give it meaning. Reality for Burke (1966, p. 5), is indeed

> [a] cluster of symbols about the past combined with whatever things we know mainly through maps, magazines, newspapers, and the like about the present…a construct of our symbol systems.

Burke (1950, p. 43) defines rhetoric as "the use of language as a symbolic means of inducing cooperation in beings that by nature respond to symbols". For him, the primary means of persuasion is identification between the rhetor and audience. Rhetoric is used as a symbolic means to express common interests required for

achieving social unity (Burke, 1950, 1966, 1969). Drawing upon the meaning-making function of language, Burkean rhetorical criticism emphasises the human relationship to language as a symbolic system. Such a symbolic system allows us to shape and interpret a world of experience as we actively construct our ways of knowing and acting through symbols. At the same time, the symbolic system and structure constrains the symbol using by defining us as social agents and constituting our ways of being in the world (Peterson, 1997; Stillar, 1998). As Burke (1969, p. 33) asserts:

> Dialectically considered men are not only in nature. The cultural accretions made possible by the language motive become "second nature" with them…. [s]ymbolic communication is not a merely external instrument, but also intrinsic to men as agents. Its motivational properties characterise both "the human situation" and what men are "in themselves".

A Burkean scope of rhetoric is vast and goes beyond formal discourse to include "[l]ess traditional forms of discourse such as sales promotion, courtship, social etiquette, education, hysteria, witchcraft and works of art such as literature and painting" (Foss et al., 2002, p. 194). Although non-verbal elements are not strictly speaking rhetoric themselves, rhetoric is considered "apparent" in their meaning (Foss et al., 2002, p. 194). In Burke's (1950, p. 172) view: "where there is persuasion, there is rhetoric. And wherever there is 'meaning', there is 'persuasion'".

Burke's rhetorical criticism was adopted widely as a method in the research field of communication studies due to an increasing influence of rhetorical and discourse analysis (e.g. Appel, 1987; Boyd, 2004; Kuseski, 1988; Moore, 1992; Olson & Olson, 2004). For example, Appel (1987) applies Burke's philosophy of dramatism and the pentad (see Section 5.6.1.1) as a method to analyse the tragic-symbol televised preaching of an American religious figure Reverend Jerry Falwell. This study finds that Falwell's discourse is strongly dramatic given his true believers are bent on the changing society he projects. Livesey (2002b) analyses texts published by ExxonMobil regarding climate change by drawing upon the Burkean method of dramatism in general and the pentad in particular. She focuses on the purposeful act of the rhetor and ethical effects of the rhetoric in maintaining organisational legitimacy. However, such applications of Burkean rhetorical criticism as a method are absent in accounting studies. This study bridges this gap by employing the

Burkean method developed by Stillar (1998) to analyse the rhetoric deployed by market, hierarchy and border institutions with regards to the GAB water risk debate.

According to Stillar (1998), this systematic framework for rhetorical criticism is based on Burke's idea of grammar, rhetoric and logology. Centred on language as symbolic action, this method complements and extends the social function of discourse analysis. *Grammatical analysis* focuses on vocabularies and structure of texts used to construct the motive. It is also an analysis or criticism of "dramatism" (Burke, 1968, p. 445), since language is perceived as both motive and act. *Rhetorical analysis* deals with the role of language in identifying and classifying or categorising social agents on one hand and providing a point of unity on the other. The exchange of discourse is viewed as the principal model through which construction and transformation of social order are attained through symbolic action. *Logological analysis* is concerned with social conditions and consequences of symbolic action. It deals with implications of symbolic action which is "conditioned by the negative and by the attendant forms of transgression that are invited by the implicit 'perfection' of various semiotic order" (Stillar, 1998, p. 62). It is important to note that while Burke's grammatical, rhetorical and logological analyses are outlined in separate sections, they "all share in the substance of symbolic acts" (Stillar, 1998, p. 88). The next section explicates this Burkean framework of rhetorical criticism in more detail.

5.7.1.1 Grammatical analysis

Burke's grammatical analysis deals with language in its own terms rather than in a traditional linguistic sense. It emphasises the way language patterns index, construct and embrace motives (Stillar, 1998). This method is termed "Dramatism" by Burke (1968, p. 445), and it is

> a method of analysis and corresponding critique of terminology designed to show that the most direct route to the study of human relations and human motives is via a methodological inquiry into cycles or clusters of terms and their functions.

As such, dramatism considers language as "primarily a species of action, or expression of attitudes, rather than an instrument of definition" (Burke, 1968, p. 447). In other words, it is concerned with the purposive use of language by agents to motivate or block certain understandings, shape attitudes and predispositions toward cooperative action (Livesey, 2002b; Peterson, 1997).

Dramatism aims to make replicable and explicit statements with regards to the function of combined language units and operates with a consistent and coherent set of terms to derive a descriptive analysis (Stillar, 1998). This method provides a means for analysing features of the texts and the relationship among them in respect of a rhetorical situation. Burke (1969, p. xv) named this means "the pentad". This pentadic model embodies five terms - scene, agent, act, agency and purpose to discern the structure and functions of symbolic action. According to Burke (1969, p. xv),

> in a rounded statement about motives, you must have some word that names the act (names what took place, in thought or deed), and another that names the scene (the background of the act, the situation in which it occurred), also you must indicate what person or kind of person (agent) performed the act, what means or instruments he used (agency), and the purpose.

The pentadic analysis helps us to understand how language represents 'reality' through investigating how a text interprets those five elements. It is important to note that such a representation is "attitudinal and motivated" since it is the "situated social practice of real social agents who necessarily construct 'reality' with reference to their practices and the terminology that are a part of them" (Stillar, 1998, p. 64). As Burke (1966, p. 45) asserts: "even if a given terminology is a reflection of reality by its very nature as a terminology, it must be a selection of reality."

Therefore, a particular textual pattern from a pentadic analysis selectively reflects a reality (Stillar, 1998). In this case, texts within the documents issued by market, hierarchy and border institutions and the rhetorical situation from which the production of those texts arises are the principal focus of grammatical criticism. Language as symbols is chosen by three different institutions, with different risk assumptions and values to define and redefine various concepts and control their meanings within the GAB water risk debate and thus produce a different 'reality' in respect of this dimension of an environmental crisis.

5.7.1.2 Rhetorical analysis

Rhetorical analysis focuses on the overriding function of language as symbolic action (Stillar, 1998). There is one key term in Burkean rhetorical criticism - "Identification" (Stillar, 1998, p. 59). Identification is concerned with humans as

both natural and social beings - we are divided in attitude, ability, interest and access to resources and so forth (Burke, 1984a). Rhetoric under this condition is "a moralising process" implied in all socialising processes to overcome division and reinforce unity (Burke, 1962, p. 563). According to Burke (1969, p. 20):

> A is not identical with his colleague, B. But insofar as their interests are joined, A is identified with B. Or he may identify himself with B even when their interests are not joined. If he assures that they are, or is persuaded to believe so.

Burke (1966, 1969) indicates that any identification is contextualised by some sense of social order which sets the conditions for determining the legitimate terms of substance for consubstantiality. Substances are constructed through production and reproduction of identities, attributes and classes by symbolic action. Burke (1969, p. 21), also explains the ambiguities of substance.

> In being identified with B, A is "substantially one" with a person other than himself. Yet at the same time he remains unique, an individual focus of motives. Thus he is both joined and separate, at once a distinct substance and consubstantial with another.

As such, identification with something or someone is to construct reality "in the same terms as another…as united by similar substance" (Stillar, 1998, p. 73). When rhetoric draws upon grammatical resources that function in respect of substances pertinent to a particular hierarchy, identification becomes possible (Stillar, 1998).

It is important to note that "hierarchy" and "order" are another two primary concepts related to rhetorical analysis (Stillar, 1998, p. 76). For Burke (1969, p. 279), hierarchy can be understood as a product of symbolic action.

> [I]n any order, there will be mysteries of hierarchy since such a principle is grounded in the very nature of language, and reinforced by the resultant diversity of occupational classes. That claim is the important thing, as regards the ultimate reaches of rhetoric. The intensities, morbidities, or particularities of mystery come from institutional sources, but the aptitude comes from the nature of man, generically, as a symbol-using animal.

To be invited to identify with some particular substances (classes, identities and attributes) represents the inherent tensions within discourses of social orders. The rhetorical acts seek to gather audiences who share interests and have a common stake in those social orders (Stillar, 1998). To overcome a division through identification in the hierarchy is to initiate a transformation. That is, to change the way "what is

seen in terms of what" (Stillar, 1998, p. 74). Therefore, members from a social group "promote social cohesion by acting rhetorically upon themselves and one another" (Burke, 1962, p. 522) (Appendix A provides an example used by Stillar (1998) to illustrate differences between grammar and rhetoric).

In this case, while grammatical analysis is concerned with the way market, hierarchy and border institutions' risk-related worldview is defined, developed and sustained as a part of a process to challenge other worldviews; rhetorical analysis investigates how the public as audiences are invited by each institution to share and believe in different risk assumptions through identification regarding the GAB water risks. The texts and discourses from various institutional documents, from a Burkean perspective, are considered as rhetorical acts seeking to "transcend and transform" both "literal" and "symbolic" division (Stillar, 1998, p. 75) with regards to GAB water risk assumptions.

For example, centre institutions construct a social order around the mysteries of science, technology and market, to transcend the cultural differences of the border institutions and the general public, to become consubstantial with their scientific, technological and efficient market practices. The implicit hierarchy within such an order is that science and technology are superior to any other alternative practice.

5.7.1.3 Logological analysis

Logological analysis discusses social conditions and consequences of symbolic actions. It is a study of how symbolic systems constrain social practices of "vision and division" and structure social consequences such as "guilt, imperfection, hierarchical psychosis-of living in terms of symbolic systems" (Stillar, 1998, p. 59). While grammatical and rhetorical analysis emphasises the dynamic process of symbolic action by drawing upon the elements in symbolic acts and characterising them as pentad, identification, hierarchy, order and transformation, logological analysis extends such analyses to symbolic systems themselves. It delves into social functions of logonomic systems. A logonomic system is a term derived from Hodge and Kress's (1988) Social Semiotics. According to Hodge and Kress (1988, p. 4), a logonomic system originates from;

> the Greek logos, which means a thought or system of thought, and also the words or discourse through which the thought is presented, and nomos, a control or ordering mechanism. A logonomic system is a set of rules prescribing the conditions for production and reception of meanings; which specify who can claim to initiate (produce, communicate) or know (receive, understand) meanings about what topics under what circumstances and with what modalities (how, when, why).

As such, logonomic systems include the system of language, discourses, intertextuality and other meaning-making systems (Stillar, 1998). An instance of text or discursive practices that involves the exchange of texts does not only have recourse to logonomic systems but, in itself, form a logonomic system which confines its potential meaning. All symbolic actions are attained through interaction with logonomic systems (Stillar, 1998). To characterise logonomic systems, we draw on the records -in the form of texts of symbolic action to analyse the evidence used to construct "the terms, features and functions of elements of logonomic systems" (Stillar, 1998, p. 78).

Burke (1970) describes texts as sources to understand the nature of language as a motivational system. In other words, words and discourses in a logonomic system order and control its subjects.

> It is our "logological" thesis that…will provide us with good insight into the nature of language itself as motive. Such an approach also involves the tentative belief that, even when men use language trivially, the motives inherent in its possible thorough use are acting somewhat as goods, however vague (Burke, 1970, p. vi).

Logology, therefore, is concerned with language as motive by focusing on conditions and consequences of logonomic systems upon which they shape and order social practices. While characterising logonomic systems through logology can be abstract, logonomic systems themselves are intrinsically social phenomena arising from "situated, historical and mediated" symbolic practices (Stillar, 1998, p. 79). According to Burke (1984b, p. 182),

> vocabularies [of a particular logonomic system] are not words alone but the social textures, the local psychoses, the institutional structures, the purposes and practices that lie behind the words.

As such, logology complements grammatical (dramatistic) and rhetorical analysis with "meditation" on the conditions and consequences of symbolic action, and

logonomic systems act as a link as well as a screening of the 'reality' (Stillar, 1998, p. 80).

According to Burke (1966, p. 50), life is lived through the "terministic screens":

> We must use terministic screens, since we can't say anything without the use of terms; whatever terms we use, they necessarily constitute a corresponding kind of screen; and any such screen necessarily directs the attention to one field rather than another. Within that field there can be different screens, each with its way of directing the attention and shaping the range of observations implicit in the given terminology.

In other words, the effect and scope of our symbolic action is conditioned and constrained by a variety of terministic screens (terminology). These terministic screens function by highlighting certain aspects for our attention and engagement (Stillar, 1998). According to Stiller (1998, p. 77), while symbolic action and its rhetorical effect produces and reproduces various social orders that are appropriate to different hierarchies, hierarchies in turn "calibrate" the social order and value it by evaluating and ranking words, things, people, acts and so on. This is achieved with reference to institutional practices, relations, social norms and expectations, as well as terministic screens - the forms of symbolic action that "articulate, reproduce and legitimate" them (Stillar, 1998, p. 77). As such, symbolic systems are considered as "perfect" since the resources and rules are combined in a logical way appropriate to the system itself (Burke, 1989, p. 263).

However, although a terministic screen facilitates a construction of its objects by highlighting relevant aspects through naming, it also makes the situation manageable and constrains our capacity to entertain other perspectives by obscuring or silencing them (Hart, 1997; Peterson, 1997; Stillar, 1998). As Burke (1984b, p. 49) says, "[a] way of seeing is also a way of not seeing".

> [I]mplications of the particular terminology in terms of which the observations are made … maybe but the spinning out of possibilities implicit in our particular choice of terms (Burke, 1966, p. 46).

Logological analysis therefore, by investigating the selecting and deflecting nature of terministic screens reminds us that the efficacy of the symbol is imbedded in its relationship to other terms, not in its essential accuracy in evaluating the symbolised (Stillar, 1998). While logonomic systems in general, and terministic screens in

particular, create bases for identification and consubstantiation, its intrinsically hierarchising and separating effects produce and reproduce inequities and divisions in social systems regarding certain debates or controversies (Livesey, 2001; Stillar, 1998). These paradoxes and ambiguities inherent in logonomic systems open doors for resistance and change (Livesey, 2001).

In this case, scientific and technology-related discourse from centre institutions' water accounts boosts the value of objectivity through quantification. In other words, "its rhetoric of non-rhetoric", is considered by border institutions as "exploitative and combative" in their alternative accounts, since it dissociates feelings and thoughts and rejects morality in terms of social and environmental responsibility (Hart, 1997, p. 265). Such terministic screens articulate, legitimate and reproduce centre institutions' expectations that humans can achieve an absolute control over nature by continuing scientific and technological progress. As Selzer (2004, pp. 264-265) contends: "Scientism…needs to be counterbalanced by [other terministic screens from border institutions with] a stress on 'intuition', 'imagination', 'vision' and 'revelation'."

To conclude, Burkean rhetorical criticism comprises grammatical, rhetorical and logological analysis as a method and enables the researcher to identify structures, features, relationships, functions and implications of symbolic action. As a method adopted in this thesis, it helps to "construct objects of analysis by picking out elements of discourse for our attention" (Stillar, 1998, p. 89).

5.8 Scope and data

As described in previous sections, the purpose of this study is to collate and compile accounts for the GAB water risk debate to investigate the culturally and institutionally constructed nature of GAB water related risks, and how it is conducted through strategic discourses in documents. In line with cultural risk theory, three institutions - market, hierarchy and border institutions actively engage in this constructive process and in the meantime, privilege different risk perspectives and corresponding risk mediation or management.

As the GAB water risk debate in this study is centred upon BHP OD's entitlement to the GAB water and its water management, the timeline covered by this study is from

2005, the year in which BHP acquired WMC, established BHP OD and applied for ODEP. It extends to October 2011, when the final decision from Commonwealth Federal Government, South Australian and Northern Territory Government about the ODEP was made.

Since this study is concerned with the contested domain of discursive construction of GAB water related risks, social and environmental accounting disclosure documents that have been produced in respect of the GAB water debate from BHP, BHP OD, WMC and other mining related associations; regulatory documents from the Federal government, South Australian government [34] and their scientists; and counter accounting disclosure related documents from civil society are analysed. These are scrutinised initially for their relevance before the compilation of contested accounts.

It is important to recall that while BHP OD's direct involvement into the GAB water risk debate started from 2005, the debate has been evolving since WMC, BHP OD's predecessor, discovered and started operating the Olympic Dam mine in 1978. Therefore, historic documents issued back then that are not covered by the timeline of the study, but are highly relevant to the GAB water controversy are also selected for analysis (The dataset of documents used in this study is also contained in Appendix C).

Since the BHP and BHP OD's water accounts represent the official corporate talk, the information was collated through mainly organisational and institutional websites and library archives using publicly available data produced directly by market institutions, which include:

<u>BHP and BHP OD</u>

Olympic Dam Environmental Management and Monitoring Report (1 July 2005-30 June 2006)

Olympic Dam Environmental Management and Monitoring Report (1 July 2006-30 June 2007)

Olympic Dam Environmental Management and Monitoring Report (1 July 2007-30 June 2008)

[34] The Northern Territory government is primarily concerned with the radioactive pollution of uranium ore from a transportation perspective, which is not directly related to the GAB water issue.

Olympic Dam Environmental Management and Monitoring Report (1 July 2008-30 June 2009)

Olympic Dam Environmental Management and Monitoring Report (1 July 2009-30 June 2010)

Olympic Dam Environmental Management and Monitoring Report (1 July 2010-30 June 2011)

Olympic Dam Environmental Management and Monitoring Report (1 July 2011-30 June 2012)

Environmental Management Program FY 11-13, 2012

Environmental Management Manual FY 11-13, 2012

Monitoring Program - Great Artesian Basin (GAB) FY 11-13, 2012

Environmental Management Program FY 08-10, 2008

Environmental Management Manual FY 08-10, 2008

Monitoring Program - Great Artesian Basin (GAB) FY 08-10, 2008

Great Artesian Basin Wellfields Report (1 July 2007- 30 June 2008)

Great Artesian Basin Wellfields Report (1 July 2008- 30 June 2009)

Great Artesian Basin Wellfields Report (1 July 2009- 30 June 2010)

Great Artesian Basin Wellfields Report (1 July 2010- 30 June 2011)

Great Artesian Basin Wellfields Report (1 July 2011- 30 June 2012)

Olympic Dam Project: Draft EIS 2009

Olympic Dam Project: Supplementary EIS 2011

BHP Billiton Sustainability Report 2006

BHP Billiton Sustainability Report 2007

BHP Billiton Sustainability Report 2008

BHP Billiton Sustainability Report 2009

BHP Billiton Sustainability Report 2010

BHP Billiton Sustainability Report 2011

BHP Billiton Sustainability Report 2012

Sustainable Water Use at Olympic Dam 2009

WMC (Western Mining Corporation)

Olympic Dam Project Draft Environmental Impact Statement 1982

Olympic Dam Project Supplement to the Draft Environmental Impact Statement 1983

Assessment of Exploration and Post - European settlement significance of the Mound Springs of South Australia 1984

Olympic Dam Expansion Project Environmental Impact Statement 1997

Australian Uranium Association

BHP Billiton's Olympic Dam Mine- Issues Briefing 2009

MCA (Minerals Council of Australia)

Draft Advice on Water Charge Rules for Recovery of Planning and Management Costs 2009

MCA response to National Water Initiative 2009 Biennial Assessment of Progress 2009

ICMM (International Council on Mining and Metals)

Water Management in Mining: a selection of case studies 2012

Media

BHP Billiton flags further development of Olympic Dam 2007

For the Australian Federal government and South Australian governments' water accounts representing hierarchy institutions' perspective on the GAB water risks, GAB water governance and regulation related documents are accessed and interrogated electronically through both governments' (and their agents') website and public release. They include:

Federal Government

(Bureau of Rural Sciences)

The Great Artesian Basin, Australia 1980

(Australian Bureau of Statistics)

Water Account Australia 2010-11

(National Water Commission)

Regional Water Resources Assessments 2009

South Australian Government

Water Allocation Plan for the Far North Prescribed Wells Area 2009

Roxby Downs Indenture Arrangements for water management 2002

Roxby Downs (Indenture Ratification) Act 1982

Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011

Parliamentary Debates (Hansard) 2005

Parliamentary Debates (Hansard) 2010

Parliamentary Debates (Hansard) 2011

Frequent Asked Questions (ODEP EIS) 2011

Assessment Report - Environmental Impact Statement Olympic Dam Expansion 2011

ACCC (Australian Competition and Consumer Commission)

Water Charge Rules for Water Planning and Management Draft Advice 2009

SAALNRM (South Australian Arid Lands Natural Resources Management (Board))

Water Allocation Plan for the Far North Prescribed Wells Area 2009

Proposed amendments to the Regional Natural Resources Management Plan 2009

Public Release (of governments' approval decision for ODEP)

Olympic Dam Mine Expansion Approved 2011

BHP's $30b Olympic Dam Expansion Approved 2011

For the civil society's water accounts representing border institutions' perspectives on the GAB water risks, publicly available and externally constructed information was confined to public submission to Draft EIS of ODEP, independent academic research, web documents from NGOs, and media outlets. It is important to note that while Aboriginal people didn't release their perspectives directly, they are represented through disclosures from other members of border institutions. These channels of information, in which many of them share same contents, portray civil society's perceptions on BHP OD's GAB water related impact, and allow adequate scoping of the thesis by providing relevant and comparative information dynamics, which include:

Public Submissions (Comment Letters)[35]

Submission number	Name/Organisation
7	Anti- Nuclear Alliance of W. A.

[35] According to BHP (2011a), there are 74 public submissions in total address the issue of BHP OD's GAB water intake and its related risks from civil scoety. Submission 136, 189, 199 and 337 are indirectly related to the GAB water issues.

8	Arid Lands Environment Centre
10	Australian Conservation Foundation
11	Australian Conservation Foundation-form letter
13	Australian Greens
24	Conservation Council of South Australia
35	Environment Centre NT
37	Environment Tasmania Inc.
42	Friends of the Earth
44	Friends of the Earth Adelaide
46	Hastings Area Nuclear Free Alliance
55	National Farmers' Association
57	Nature Conservation Society of South Australia
62	Outback Areas Community Development Trust
65	People for Nuclear Disarmament
77	Roxstop Action
85	The Macleay Nuclear Free Alliance
88	United Nations Association of Australia South Australia
92	Women's International League for Peace and Freedom
95	Worms SA
97	Ms Jess Abrahams
99	Miriam Amery-Gale
102	Ms Christine Arnold
105	Ms Yvonne Badger
114	Ms Antoinette Bentley
116	Ms Cath Blakey
125	Ms Jamie Brideson
136	Ms Catherine Cox
138	Ms Helen Crawford
146	Mr John Denlay
147	Mr Andrew Derrick
159	Ms Renee Engl
161	Mr William Alford Fisher

180	Ms Sophie Green
185	Mr Anthony Hack
189	Ms Lisa Hall
196	Ms Kristy Henderson (also represents Aboriginal group's interests)
199	Ms Kellie higginbottom
204	Ms Lyn Hovey
206	Ms Madeline Hudson
216	Ms Dawn Jecks
217	Mr Harry Johnson
224	Mr S Keyes
233	Mr Al Lad (also represents Aboriginal group's interests)
241	Ms Joanne and John Lewis
244	Mr Alan, Jenny, Antony and Natalie Luesby
247	Ms Michele Madigan
248	Ms Petrina Maizey
254	Ms Janet Mayer
255	Mr Chris McBride
258	Ms Ella Mckinley
287	Ms Susanna Pearson
288	Hon Liz Penfold
289	Mr Joseph Philippa
292	Mr John H Pope
297	Mr Richard Quilty & Willem Vervoort
299	Ms Eva Rainow
304	Ms Georgia Roberts
306	Ms Amanda Rowe
309	Ms Angela Rozali
313	Ms Gabrielle Scarman
315	Ms Rachel Scarman
328	Mr Daniel Spencer
331	Ms Alys Stevens
335	Mr Samantha Sunners

337	Ms Rebecca Taylor
343	Ms Miriam Tonkin
345	Mr Andrea Tschirner
351	Ms Janelle Veitch
352	Ms Narelle Walker
353	Mr Tim Walsh
363	Jessie Wells -second submission
388	Confidential
389	Confidential

Independent Academic Research References

The Plutonic Waters of the Great Artesian Basin (Endersbee, 2000b)

The Great Artesian Basin Management of Water resources after 100 Years of Development (Hillier, 1996)

Mound Springs of the Great Artesian Basin in South Australia: A case study from Olympic Dam (Mudd, 2000) (also represents Aboriginal group's interests)

The Sustainability of Use of Groundwater from the South-Western Edge of the Great Artesian Basin with Particular Reference to the Impact on the Mound Springs of the Borefields of Western mining Corporation (Keane, 1997) (also represents Aboriginal group's interests)

Web Documents from NGOs

(Great Artesian Basin Protection Group)

Impact of Olympic Dam/ Roxby Downs 2009

Management History 2009

Submission 2009

Government Documents 2009

(Save the Basin)

Save the Great Artesian Basin from Olympic Dam: An Ethical Issue 2011

BHP Billiton Assertion 2011

Read What the Minister for water says 2011

(Friend of the Earth)

Campaign: Expansion of Roxby Downs 2011

(Friend of the Earth Australia)

Watered Down Negotiations - WMC Picks Both Sides 1996

Summary + Articles re Olympic Dam Mine Expansion 2011

(Friend of the Earth Adelaide)

Above the Law? Roxby Downs and BHP Billiton's Legal Privileges 2006

Media

'Corporate Abuse' hits Great Artesian Basin 2009

Protect the Great Artesian Basin! Stop Olympic Dam! 2011(also represents Aboriginal group's interests)

BHP gets Approval for World's Largest Open Pit Mine 2011

S.A. Government and BHP Billiton sign Olympic Dam Deal 2011

Industry Welcomes Uranium Mine Expansion 2011 (also represents Aboriginal group's interests)

S.A. Greens fault BHP's Olympic Dam safeguards 2011

Greens leader Mark Parnell has Welcomed 2011

In an effort to improve benefits for South 2011

Australian Greens' Public Release:

Mark Parnell Speech (Parliamentary Debates)

Australian Greens: BHP: "Jump!" Government: "how high?" 2011

Greens Bill: Roxby Downs (Indenture Ratification) (Application of Acts) Amendment Bill 2007

South Australia, Legislative Council, Parliamentary Debates 2011

While the use of market institutions' social and environmental disclosures and hierarchy institutions' regulatory disclosures help to ameliorate the researcher bias, this bias seems to prevail more in the alternative disclosures representing the perspectives of civil society. To mitigate this bias, information was captured from a wide range of media outlets which are syndicated sharing identical contents. These articles were then scrutinised with tracing of further references before information was selected based on its relevance to the BHP OD's mining operation and its social and environmental effects on the GAB groundwater system. To further augment editorial bias, the selected information was paraphrased closely or quoted directly to compile the alternative accounts. It is important to note that while these accounts comprised of externally sourced and web-based information can also be biased, subjective and partisan (Spence, 2009), they are argued to perform a "balancing view in the face of the considerable resources that organisations have at their disposal" (Gibson, Gray, Laing & Dey, 2001, p. 1) and "will be almost bound to improve on the accounts that the average company will prepare on and by itself" (Medawar, 1976, p. 394).

5.9 **Method and approach**

The data analysis for this study is an iterative process, which occurs both during and after the data collection. It includes six stages. At the first stage, a wide range of publicly available disclosure documents related to the GAB water risk debate were searched, gathered and read through so as to generate a broad picture for identifying important sustainability issues and major stakeholder groups. The complete dataset consists of 37 documents from market institutions, 17 documents from hierarchy institutions and 101 documents from border institutions (Section 5.8).

At the second stage, the emphasis was on a discussion of whether the GAB groundwater system is 'replenishable' or 'inrechargeable' (see Chapter 7); a public dispute over the economic, social and environmental benefits deriving from BHP OD's mining operation and proposed ODEP (see Chapter 8); and, a controversy over

potential social and environmental consequences (re) allocated to different institutional groups within society triggered by GAB water resource management and planning activity led by government agencies (see Chapter 9). Relevant excerpts from these discussions are collected into three databases, one for each institution. It is notable that these three major debates had been narrowed down and developed into three themes for data analysis in the fifth stage.

At the third stage, the focus was on rhetorical effects of risk-related reasoning and argumentations employed by three institutions - the market (BHP, BHP OD, WMC and other mining related associations); the hierarchy (the Australian Federal government, South Australian government and their scientists), and the border (civil society). Burkean rhetoric criticism was applied to cultural risk theory (Chapter 6, Section 6.3) to identify features, functions and implications of each institutional risk discursive practices. Making those theoretical elements explicit in turn provides analytical scaffolding against which the compilation and evaluation of three different sets of accounts could be facilitated.

There are nine risk-based sustainability notions which form major concepts of cultural risk theory (see Chapter 6, Table 6.1). They are 'preferred learning style' (feature), 'view of nature' (function), 'property of knowledge ideal' (implication), 'attitude towards technology' (feature), 'view of risk' (function), 'resolution of risk' (implication), 'cause of ecological crisis' (feature), 'view of justice and fairness' (function) and 'property of desired system' (implication). These nine concepts were specifically identified for the GAB water risk debate arising from BHP OD's mining operation, and they enable researcher to align contents of the market institution's water accounts to those from hierarchy institutions and border institutions.

At the fourth stage, three databases were re-read individually to highlight and code contents that are reflective of and consistent with those nine concepts of cultural risk theory. The close paraphrasing and/or the direct quote from these contents (excerpts) are recorded and collated into three sets of accounts - one for market institutions, one for hierarchy and one for border institutions. The purpose of this stage is to handle an otherwise unmanageable body of text to compile parallel (aligned and/or counter) information for the further interpretation of the GAB water risk debate.

At the fifth stage, both cultural risk theory and the comparative information in three sets of accounts were read through for numerous rounds to facilitate the interpretation of different institutional risk discursive practices against nine risk-based sustainability theoretical concepts. This iterative analysis aided the development of a taxonomy (categorisation and formation) of three somewhat coherent stories/themes (Chapter 7, 8, 9) - on how the ideology or value system inscribed in corporate disclosure is aligned with or differs from that in governmental regulatory disclosures, and how these normalised and taken-for-granted assumptions of business and (sometimes) government are resisted and challenged by the NGOs, environmental activists and Aboriginal groups from civil society.

At the final stage, the interpretation of corporate narratives and governmental narratives, juxtaposed with the counter-narratives from civil society for three themes were scrutinised and reorganised individually (with the guidance of supervisors), for further discussions of implications on three critical accounting themes - 'concept of control' (see Chapter 7, Section 7.4); 'stewardship' (see Chapter 8, Section 8.4) and 'economic consequences' (see Chapter 9, Section 9.4). Accountability 'gaps' were also identified - between managerial accountability (from corporate claim); administrative accountability (from governmental talk) and moral accountability (from counter-narrative), corresponding to the social and environmental impacts that BHP OD's mining operation has on the GAB groundwater system. This thesis therefore echoes the call for a dialogical accounting approach to accounting which promotes democratic participation in a 'polylogic' society (Brown, 2009; Gray, 1992).

5.10 **Summary**

This chapter presented the method adopted, the relevant data and process of data analysis used in this thesis. This thesis explores the GAB water risk debate by compiling and analysing three sets of accounts from market, hierarchy and border institutions' disclosures respectively, resonant with a critical accounting approach. The interpretive structuralist approach to discourse analysis explicitly emphasises the subjective nature of the sense-making and interpretive process. The method of Burkean rhetorical criticism aims to analyse different institutional texts at three

different levels - grammar, rhetoric and logology with a focus on concepts such as the pentad, identification, hierarchy, order and terministic screens.

Given that allocative hydro-politics are necessarily discursive due to contending articulated concerns (Allan, 2005), discourse analysis in general and rhetorical criticism in particular are considered as the appropriate research method for this thesis to investigate accounting and alternative (including counter) accounting information and discourse dynamics of this political contest with regard to the GAB water debate. In practice, data collection and analysis was conducted through numerous rounds of reading and organising major themes of disclosure documents from three institutions, based on the cultural risk theory. The next chapter introduces a cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) to assist the interpretation of institutional discourses in respect of the GAB water risk.

CHAPTER 6 CULTURAL RISK THEORY

6.1 Introduction

The previous chapter explained the research method used in the thesis to examine how the contested Great Artesian Basin (GAB) water disclosure is manifest through cultural risk perceptions and practices. Given the methodological assumption in Chapter 4, risks are recognised and selected by cultural norms, standards and constraints (Cheit, 1983; Park, 2010). This chapter introduces cultural risk theory (Douglas & Wildavsky, 1982) to facilitate an interpretation of institutional discourse with respect to the GAB water risk.

The cultural risk theory informed by the Grid/Group typology (Douglas, 1970) and the Risk and Culture model (Douglas & Wildavsky, 1982), and further developed by Thompson et al., (1990), Schwarz and Thompson (1990) and Thompson and Rayner (1998) provides four (including three active, one inert and passive) institutional typologies and explicates different institutional positions and responses towards the GAB water governance related politics, technology and social choice within a context of sustainable development. According to cultural risk theory, it is these different risk perspectives that trigger the debate in the form of contested water disclosures. Therefore, each institutional risk discourse can be understood as rhetorical in nature.

Since Burkean rhetorical criticism outlined in Chapter 5 identifies and interprets the features, functions and implications of discursive practices (Stillar, 1998), applying this framework to cultural risk theory allows the researcher to identify various notions of conceptualising risk-based sustainability, its associated features, functions and implications of each institutional groups' risk discourse. In this thesis, these are: preferred learning style (feature); view of nature (function); properties of knowledge ideal (implication); attitude towards technology (feature); view of risk (function); resolution of risk (implication); cause of ecological crisis (feature); view of justice and fairness (function); and, properties of desired system (implication).

These nine concepts in turn are linked to three accounting and accountability related themes. Preferred learning style, view of nature and property of knowledge ideals from three active institutions help to understand the contested nature of the

accounting concept of control with associated accounting recognition and measurement rules. Institutional assumptions about the attitude towards technology, and a view of risk and risk resolution, facilitate the understanding of the stewardship debate from both mainstream and critical accounting perspectives. Institutional perceptions of the cause of the ecological crisis, view of justice and fairness and property of desired system enable an analysis of resource allocation issue and its associated economic consequences arguments, to further understand accounting and accountability.

This chapter first introduces cultural risk theory in general (Douglas, 1970; Douglas & Wildavsky, 1982) (Section 6.2). The three fold Burkean framework of rhetorical criticism is then applied to cultural risk theory to tease out the theoretical elements for each institutional risk discursive practice (Section 6.3). Three critical themes derived from these institutional discourses are finally discussed with an implication for accounting research and practice (Section 6.4).

6.2 Cultural risk theory

A cultural theory of risk suggests that any particular view or position of individuals towards risk is shaped by the beliefs and values of the cultural group to which they belong (Douglas & Wildavsky, 1982; Tansey & O'Riordan, 1999). Risk therefore, can be seen as a social choice and cultural selection which is constructed for defending a particular way of life (Douglas & Wildavsky, 1982; Moerman & van der Laan, 2012; Reddy, 1996). In this thesis, a cultural risk perspective is used to critically explore the underlying assumptions for contentious water related disclosures and accountability discourses. Cultural theories of risk originally derived from the early studies of ritual in tribal communities (Krimsky, 1992; Rayner, 1992; Renn, 1992). American anthropologist Mary Douglas, with her colleagues, investigated ‘forbidden’ activities in tribal societies and identified several generic value clusters and cultural patterns that form early organizational principles in tribal groups (Douglas, 1966; Douglas & Wildavsky, 1982). According to these principles, different groups develop particular risk positions and strategies to reinforce the religious and moral order of the group (Renn, 1992).

Like African tribal communities, organisations, social groups or societies in contemporary western society use the notion of risk as a modern strategy to "establish and maintain conceptual boundaries between self and other" (Lupton, 1999, pp. 24-25). As the role of taboo in tribal cultures is to protect the tribe from certain destabilising behaviour, the symbolic aspects of perceptions about purity, pollution and otherness are linked to risk and serve to bolster social cohesion and fend off threats of disorder (Douglas, 1966; Lupton, 1999). Risk is understood from a cultural perspective as the offence or violation of cultural values and expectations. Emotions such as anger, fear, desperation or hatred are manifestations of risk (Lupton, 1999).

Cultural risk frameworks were developed to explain various risk phenomena, such as how different social and cultural structures influence individual risk perceptions and accepted levels of risk e.g. Grid/Group typology (Douglas, 1970; Douglas, 1985; Thompson, 1980) and institutional-biased political debate and policy decision-making e.g. Risk and Culture model (Douglas & Wildavsky, 1982). In this thesis, the institutional debate of GAB water related risks from BHP OD's GAB water extraction and its proposed ODEP are analysed, using the combination of Grid/Group typology and Risk and Culture model. The unit of analysis is an 'aggregate of individuals' i.e. the institutional group. According to Douglas (1985, p. 67), culture is

> [the] actively invoked conventional wisdom...[and] the publicly shared collection of principles and values used at any one time to justify behaviour...[and] uphold the forms of institutional life.

In this sense, people who live in a particular social institution are affected and monitored by its norms, standards and constraints (Cheit, 1983; Park, 2010). It is these institutional processes and cultural dynamics that mediate "social patterns and relationships" (Moerman & van der Laan, 2012, p. 110) and determine risk selection (Bowen, 1995; Elliott, 1983).

> [T]he choice of risks to worry about depends on the social forms selected. The choice of risk and the choice of how to live are taken together. Each form of social life has its own typical risk portfolio. Common values lead to common fears... This cultural bias is integral to social organization. Risk taking and risk aversion, shared confidence and shared fears, are part of the dialogue on how best

> to organize social relations. For to organize means to organize some things in and other things out (Douglas & Wildavsky, 1982, p. 8).

As such, culture is considered as "the coding principle" (Douglas, 1985, p. 68) through which risks are recognised, selected and framed, usually inseparable from public ideas and issues associated with justice, power and legitimacy (Moerman & van der Laan, 2012; Tansey & O'Riordan, 1999). These predefined codes or categories constitute and stablise sets of meaning to facilitate communication and decision-making of any new phenomenon within society (Douglas & Wildavsky, 1982).

The Grid/Group typology has been developed from ethnographic studies (Douglas, 1970). According to the Grid/Group typology, there are four principal ways of perceiving and structuring human relations (Douglas, 1970). Each cultural unit unfolds in contradistinction to one another which constitute a continuous "cultural dialogue" (Linsley & Shrives, 2014, p. 757) of which ways of defining, valuing and resolving social issues should be supported (Ney & Thompson, 2011). In Douglas' (2013, p. 290) words, "[a]t all times, a culture is responding to the individual culture bearers and how they are dealing with each other."

The Grid scale measures the extent of role differentiation and social classification that individuals as social actors are constrained. Group scale, by contrast, is concerned with the degree of collective commitment to which those social beings are subjected (Douglas, 1970; Ney & Thompson, 2011; Schwarz & Thompson, 1990). A high-grid state stands for a significant bundle of social constraints on interacting social members. Distribution of roles here are dependent on the explicit social stratification, such as gender, age, colour, hierarchical position, and so on (Douglas, 1970; Linsley & Shrives, 2009; Ney & Thompson, 2011).A low-grid state indicates the weak limits of classificatory differentiation on the range of social activities and options open to social members. Social roles here can be chosen freely without prejudice, depending on either personal capacities of competing or negotiating for them; or formal policies ensuring equal opportunity for competition (Linsley & Shrives, 2009; Ney & Thompson, 2011).

A high-group state designates that there are strongly shared aims and tight social identity for actors within the society. A low group state, in contrast, is associated

with little or no cohesion between people and sparse sense of interdependence (Linsley & Shrives, 2009; Ney & Thompson, 2011).Overall, the Grid/Group typology gives rise to four cultural solidarities: individualists (low grid, low group), hierarchists (high grid, high group), egalitarians (low grid, high group) and fatalists (high grid, low group).

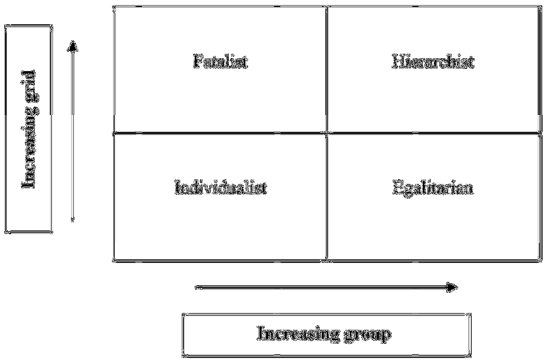

Figure 6.1 Grid/Group Model

Source: Douglas (1982, in Linsley & Shrives, 2009, p. 495)

Individualistic solidarity emphasises the individual autonomy and the resultant freedom to transact with each other. The principal motivation underlying such alliance is to gain resources with no binding loyalty to others (Linsley & Shrives, 2009, 2014). As Douglas (2003, p. 1358) asserts, individualists are "expected to go forth entrepreneurially, get new ideas, work hard, and compete for esteem and income".

Hierarchical solidarity respects hierarchical values and procedural rules (Douglas, 1985). Social roles within such solidarity are well-defined; where customs and traditions constitute an important component of institutional life (Linsley & Shrives, 2009). Being faithful to stability, hierarchical solidarity emphasises maintaining boundaries, both internally and externally (Linsley & Shrives, 2009).

Egalitarian solidarity stresses the wellbeing of the group and the level of commitment, which results in a constraint on human self-interested behaviours, with clear demarcation of the external boundary (Linsley & Shrives, 2009). Despite the

close-knit nature of such solidarity, social roles for individuals are unrestricted and it is difficult to establish and assert authority (Linsley & Shrives, 2014).

Fatalist solidarity is the final classification where individuals are highly restricted with respect to the selection of social roles and little opportunity for self-determination (Linsley & Shrives, 2009). In addition, members of this solidarity are relatively inert, isolated and alienated with little sense of community (Linsley & Shrives, 2014).

Built upon Grid/Group typology, the further development of Risk and Culture model (Douglas & Wildavsky, 1982) assumes that cultural theory can also be applicable to the analyses of policy actors beyond individuals and their social context. In this model, institutional values equalise the concept of individual risk perception (Cheit, 1983).

According to Douglas and Wildavsky (1982), a social system embraces 'the centre' and 'the border'. The centre institutions consist of market (individualistic) and hierarchy (hierarchical) cultures, whereas the border institutions are characterised by sectarian (egalitarian) interests. These three types of institutions have distinct ideas and theories regarding proper or improper social organisation (Park, 2010), and they participate in public debate and decision-making either through exerting power or monitoring the powerful (Cheit, 1983; Douglas & Wildavsky, 1982).

It is notable that it is only these three active solidarities - the individualistic, the hierarchical and the egalitarians are explicitly and positively involved in policy-setting through different but complementary ways (Ney & Thompson, 2011; Schwarz & Thompson, 1990). Fatalists, in contrast, are those passive individuals whom each active solidarity seeks to mobilise in order to advance their cause (Schwarz & Thompson, 1990). Market institutions made up of individualists champion the system of free market and seek to maximise utility (Douglas & Wildavsky, 1982). They believe in "a means-end rationality" (Douglas, 1985, p. 87) which results in implicit controls and favours self-regulation (Lupton, 1999; Park, 2010). Viewing economic risks as the most significant threat, market institutions value fair play and protected contracts in an exchange system, and introduce standardised measures (Douglas & Wildavsky, 1982), such as accounting practices

(Moerman & van der Laan, 2012) to solve common problems. However, risks are not necessarily regarded as negative, as they also offer opportunities (Douglas & Wildavsky, 1982; Linsley & Shrives, 2009; Moerman & van der Laan, 2012). Market institutions are oriented towards the present, and therefore assume a short-term perspective of risk (Douglas & Wildavsky, 1982).

Within hierarchy institutions comprising hierarchists, the system of justice rewards loyalty and punishes unorthodox attitudes and behaviours through regulations (Douglas & Wildavsky, 1982; Elliott, 1983; Linsley & Shrives, 2009). Hierarchies tend to have "multiple... vague... [and] modest" objectives, and correspondingly the decision making process is "incremental; remedial and serial" (Douglas & Wildavsky, 1982, p. 93). Actions, such as foreign attacks that undermine institutional order and rules, are deemed most threatening. Economic risks are acceptable to the degree that they are manageable within standardized operating procedures (Douglas & Wildavsky, 1982; Jaeger, Renn, Rosa & Webler, 2001). As such, hierarchies are often dependent on professional knowledge and expertise (Linsley & Shrives, 2009; Moerman & van der Laan, 2012).

Despite divergent views between market and hierarchy institutions, they adopt similar ideas and understandings of risk and danger (Douglas & Wildavsky, 1982), and coexist and collaborate to some extent as the 'centre' (Elliott, 1983; Linsley & Shrives, 2009). When interests of both institutions intersect, their power becomes formidable (Linsley & Shrives, 2009; Moerman & van der Laan, 2012), and risks are considered "properly managed" within the centre, "unless social disorder exists" (Durkin, 1990, p. 5).

Border or periphery institutions consist of sectarian (egalitarian) groups, which recruit and bind members in opposition to the centre organisations (Douglas & Wildavsky, 1982). Concepts such as equality and justice reside in the border (Douglas & Wildavsky, 1982; Linsley & Shrives, 2009) and often criticise the injustice and inequity perpetuated by the centre institutions (Douglas & Wildavsky, 1982; Moerman & van der Laan, 2012; Tansey & O'Riordan, 1999) e.g. the environmental risk of pollution from advanced technologies (Park, 2010). Once

individuals “align themselves with the border”, the centre institutions are seen as failing to manage risks and these “risks become social” (Durkin, 1990, p. 5).

Fatalist solidarity, on the other hand, incorporates passive outsiders for both centre and border institutions. These marginal members of society perceive the world as ‘capricious’ and human beings as untrustworthy (Ney & Thompson, 2011; Schwarz & Thompson, 1990). The resulting submissive towards risk and fairness therefore is that there can be no control over any event and themselves resign as merely victims of fate (Linsley & Shrives, 2009, 2014). For fatalists, “[s]preading democracy and peace around the world maybe a lofty endeavour, but it is not a realistic goal… everyone has to fend for themselves, which the devil takes the hindmost”[36](Ney & Thompson, 2011, p. 38).

Although fatalist solidarity is found to produce no policy suggestion, they still remain relevant to these potential policies. As Schwarz & Thompson (1990, p. 10) contend:

> They are the great risk absorbers, enduring with more or less dignity, greater or lesser ignorance, whatever comes their way: a social sponge that the active policy-makers, in their different ways, publicly wring their hands over and privately make good use of.

As such, without fatalists, the rest of the society would not be capable to implement their favoured policies (Schwarz & Thompson, 1990).The combination of Grid/Group typology and Risk and Culture model provides a theoretical framework, not only to explicitly acknowledge the diverse institutional responses to manage risks, but also to answer questions about the policy decision-making process (Park, 2010, p. 82) - [w]hy policy makers and stakeholders support different policies; how the policy agenda changes; why different societies focus on different policy issues, and so on”. Cultural risk theory has also been expanded by other scholars to synthesise a more recent intellectual development in natural resource ecology and anthropology, to further conceptualise politics; technology; and, social choice

[36] According to Ney and Thompson (2011, p. 40), however, “this ‘non-story’ also contains a kernel of truth. Sometimes, a social ill – however pressing it may seem or feel - maybe unsolvable for instance due to its sheer complexity. In fact, it may happen that any attempts to address the issue end up making matters worse. In those cases, the resignation that this way of life induces might provide much needed wisdom and solace”.

against a backdrop of sustainable development (e.g. Schwarz & Thompson, 1990; Thompson & Rayner, 1998).

This theoretical framework enables an analysis of different positions taken by market institutions (represented by BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD)); hierarchy institutions (represented by Federal, and South Australia governments); and border institutions (represented by civil society), regarding GAB water related risks from BHP OD's GAB water extraction and its further proposal of Olympic Dam Expansion Project (ODEP) (Justifications are provided in Chapter 7, 8, and 9). BHP and BHP OD are identified as market institutions since they demonstrate an overriding goal of profit maximisation and shareholder value. The hierarchy institutions are identified being represented by the Australian Federal and South Australian governments that regulate the GAB water allocation regimes and corporate activities. The border institutions are identified as members from civil society, including Non-Government Organisations (NGOs), environmental activists and Aboriginal groups who are high-profile GAB conservationists protesting against BHP OD's water intake for its mining operations. There are no identified responses and positions from fatalist solidarity - such a result from data collect has also, unsurprisingly, reflected and reinforced the theoretical suggestion and expectation.

Table 6.1 Main Representors of Centre and Border Institutions

Centre		Border
Market Institutions	Hierarchy Institutions	Border Institutions
BHP & BHP OD	Australian Federal Government & South Australian Government	Civil Society

This cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) facilitates an understanding of how "risk-related discourse and strategies" operate within centre institutions, and how they are "negotiated and resisted by those who are the subject of them [mainly members from border institutions]" (Lupton, 1999, p. 102). The next section presents three themes of cultural risk theory, with the application of the Burkean method of rhetorical criticism.

6.3 Application of Burkean rhetorical criticism to cultural risk theory

As explicated in Chapter 5, the Burkean framework of rhetorical criticism comprises three complex but complementary vocabularies to enable researcher to identify structures, features, relationships, functions and implications of symbolic action. While grammatical analysis emphasises the way language patterns index, construct and embrace motives, rhetorical analysis focuses on the overriding function of language - to overcome division and reinforce unity as symbolic action (Stillar, 1998). Logological analysis on the other hand, discusses social conditions and consequences of symbolic actions (Stillar, 1998). This three-fold theoretical framework as a method enables the identification and interpretation of "significant, salient features and functions" of symbolic actions or discursive practices (Stillar, 1998, p. 88).

Cultural theory of risk considers positions of risk as they are shaped by cultural beliefs and values (Douglas & Wildavsky, 1982). Different meanings of risk are manifest through three institutional risk discourses, to facilitate communication and decision-making within society. Each institutional risk discourse or symbolic action can be understood as rhetoric in nature, since distinctive risk perspectives are viewed as social choice and cultural selection constructed for defending a particular way of life (Douglas & Wildavsky, 1982). Applying the three-fold Burkean framework of rhetorical criticism to cultural risk theory allows a researcher to identify features, functions and implications of each institutional risk discursive practice. Teasing out these theoretical concepts explicitly in turn, provides an analytical scaffolding to facilitate an interpretation of the GAB water risk debate (Chapter 7, 8, 9).

There are nine concepts of risk-based sustainability, representing features, functions and implications of three institutional discourses (Table 6.2). According to Stillar (1998), Burkean grammatical analysis focuses on vocabularies and the structure of texts used to construct motive. In the case of cultural risk theory, market, hierarchy and border institutions represent diverse learning styles, attitudes towards technology and causes of ecological crisis to motivate or block certain understandings and shape predispositions toward cooperative action (Livesey, 2002a; Peterson, 1997).

Drawing on grammatical resources, Burkean rhetorical analysis deals with the role of language in identifying and classifying social agents on one hand and providing a

point of unity on the other (Stillar, 1998). In the case of cultural risk theory, market, hierarchy and border institutions, by representing diverse learning styles, attitudes towards technology and causes of ecological crisis, identify different social orders related to views of nature, risk, justice and fairness. These institutions gather audiences who share interests and have a common stake in those social orders through rhetorical acts (Stillar, 1998).

Burkean logological analysis complements grammatical and rhetorical analysis with concerns about the social conditions and consequences of symbolic action (Stillar, 1998). In the case of cultural risk theory, market and hierarchy (centre) institutions' symbolic actions, whilst representing their preferred learning style, attitudes towards technology and causes of ecological crisis and identifying certain social orders related to views of nature, risk and justice and fairness; create hierarchising and separating effects, which produce and reproduce divisions and inequities in social systems (Livesey, 2001; Stillar, 1998). These hierarchising and separating effects are derived in respect of properties of knowledge ideal, resolution of risk and properties of a desired system. The paradoxes and controversies (see Chapter 5, Section 5.6.1.3) inherent in the centre institutions' logonomic system in general, and terministic screens in particular, open doors for resistance and transformation by border institutions. In Selzer's (2004, pp. 264-265) words, logonomic systems and terministic screens of the centre institutions need to be "counterbalanced" by those from border institutions.

In this section, the major concepts of cultural risk theory are presented in Table 6.1 with the application of the Burkean framework of rhetorical criticism.

Table 6.2 Application of Burkean Rhetorical Criticism Framework to Cultural Risk Theory to determine major Theoretical Concepts

Major Concepts	Market Institutions	Hierarchy Institutions	Border Institutions
Grammatical Analysis			
Preferred Learning Style	Science (Trial and Error)	Expertise	Holism
Rhetorical Analysis			
View of Nature	Cornucopian and Abundant	Stable within Boundaries	Ephemeral and Fragile
Logological Analysis			
Properties of Knowledge ideal	Objectivity	Procedural Validity	Imperfection
Grammatical Analysis			
Attitude towards Technology	Pro-technology	Technical Fix	Anti-Technology
Rhetorical Analysis			
View of Risk	Opportunity	Controllability	Need to Minimise
Logological Analysis			
Resolution of Risk	Economic Growth	Regulation	Low Growth and Invasiveness
Grammatical Analysis			
Cause of Ecological Crisis	Government Intervention	Loss of Control	Inequitable System
Rhetorical Analysis			
View of Justice and Fairness	Equality of Opportunity	Equality before Law	Equality of Condition and Result
Logological Analysis			
Properties of Desired System	Free Market	Governance and Planning	Social and Environmental equity

Adapted from: Schwarz and Thompson (1990, pp. 66-67, see also Ney & Thompson, 2011; 1990; Thompson, 1980; Thompson et al., 1990; Thompson & Rayner, 1998)

6.3.1 Preferred learning style, View of nature and Properties of knowledge ideal

In this study, market, hierarchy and border institutions represent diverse learning styles to motivate certain understandings of sustainable development and shape attitudes towards cooperative action. These different learning styles, in turn, identify different social orders regarding the view of nature and revealed through different sets of discourses. These discourses are symbolic actions of market and hierarchy (centre) institutions. They have hierarchising and separating effects in respect of properties of their knowledge ideals. These paradoxes and controversies are challenged by border institutions through ‘counter’ discourses or symbolic actions.

6.3.1.1 Grammatical analysis - Preferred learning style

Contested learning styles in the broader context of sustainable development are constructed by market, hierarchy and border institutions through discursive practices. Market institutions are agents who support the development of modern science as agency against the backdrop of modernisation (Douglas & Wildavsky, 1982). Since scientific knowledge "make[s] us modern…[and] advanced statistics enable us to calculate [the risks]" (Douglas & Wildavsky, 1982, p. 29), market institutions' purpose is to control and manage natural resources and "rule the world" (Douglas & Wildavsky, 1982, p. 30) through acts which prompt "bold experimentation in the face of uncertainty" (Thompson et al., 1990, p. 27). Quantification is constructed by market institutions as "a method of stating problems" (Douglas & Wildavsky, 1982, p. 101). A trust in quantification is manifest through the construction of risk probability (Douglas & Wildavsky, 1982).

However, although science is said to have broadened the area of the unknown to a certain degree, scientific development such as probabilistic risk analysis is characterised by market institutions as an ever-evolving process, and therefore is subject to error and uncertainty (Douglas & Wildavsky, 1982). For example, scientific efforts are said to entail possibly negative results due to false assumptions, defective measures, faulty data, and poorly-conducted experiments (Douglas & Wildavsky, 1982). In this thesis, border institutions believe that the centre institutions' assumption of the 'rechargeability' of the GAB is flawed and BHP OD's modelling studies are faulty due to simplistic models and limited data (Chapter 7, Section 7.3.1).

Hierarchy institutions construct themselves as agents that know about the boundary line between nature's equilibrium and disequilibrium zones, in respect of human intervention (Thompson et al., 1990). Since hierarchy institutions believe that the ecosystem can only be stable within certain limits of human interaction - neither 'unbridled interference' nor the 'tiptoe response' is the moral concern (Thompson et al., 1990). Therefore expert knowledge, based on the assumption that certified experts can generate objective and true knowledge (Ney & Thompson, 2011) becomes the agency for determining limits and predicting certainty, matched within the complexity and time span of the risk issue (Schwarz & Thompson, 1990).

As such, hierarchy institutions construct an unshakable faith in expert predictions for "a comprehensive, objective and balanced view of the subjective matter" (Ney & Thompson, 2011, p. 65). While this view reflects "the mainstream academic literature and are supported by thousands of scientists" (Ney & Thompson, 2011, p.66), this hierarchical way of processing 'valid information' is congruent with that of the market, both believing in the authority of science and expertise.

As noted by Douglas and Wildavsky (1982), hierarchists believe in the limitations of calculations. They therefore construct professional knowledge as subject to a continuously evolving and updated process. This view is consistent with the trial and error learning style of the market institutions.

> Again, and for different reasons, their bias on risks coincides. Hierarchists can take free- lance entrepreneurs and brokers for advisers because there is sufficient understanding between them (Douglas & Wildavsky, 1982, p. 100).

Border institutions construct themselves as agents whose act is characterised by "timorous forbearance" which necessitates "effective sanction" for prevention of any possible catastrophe (Thompson et al., 1990, p. 27). Border institutions believe that the act of bold experimentation and continuous trial and error processes from centre institutions are a way of regulating institutional life that is culpable and more likely to cause irreversible damage (Thompson et al., 1990). Border institutions insist that holistic knowledge, as the agent, is the key to understanding and protecting a fragile nature with depleting resources (Ney & Thompson, 2011). Therefore, border institutions tend to collect, organise and reveal hidden assumptions, flawed experiments and limited data which are usually excluded from market and hierarchy (centre) institutions' disclosures to the public (Douglas & Wildavsky, 1982).

As constructed by border institutions, the degree of knowledge completeness does not only require the acknowledgement of non-scientific knowledge, but also embraces that knowledge beyond the field of formal scientific inquiry. Aboriginal knowledge for example, has taught that life in all kinds of forms are connected vitally - "everything is connected to everything else" (Ney & Thompson, 2011, p. 41).

6.3.1.2 Rhetorical analysis - View of nature

Based on a view of science as the appropriate agency for learning style, market institutions believe they are intelligent and informed human agents who conquer and improve nature based on ingenuity (Ostrander, 1982). This is enacted by market institutions by framing public interest in "a wonderfully robust and bountiful natural world" with abundant resources (Ney & Thompson, 2011, p. 48). A hierarchy or social order between nature and humans is subsequently constructed. Market institutions promptly advocate the myth of a "[b]enign" nature (Ney & Thompson, 2011, p. 48), which is "morally neutral" (Douglas & Wildavsky, 1982, p. 29), resilient and able to accommodate change (Douglas & Wildavsky, 1982; Ney & Thompson, 2011). In Douglas and Wildavsky's (1982, p. 63) words, "Mother Nature [is] merely secreting a healthy amount of dirt".

Drawing upon expert knowledge as the agency for learning style, hierarchy institutions exploit the strategy of identification with public interest by constructing themselves as responsible human agents who protect nature within ecological boundaries (Thompson et al., 1990). Hierarchy institutions consequently establish a hierarchy or social order discursively. Nature is constructed as a scarce, albeit stable, resource with "precise and knowable limits" (Schwarz & Thompson, 1990, p. 65). When pushed beyond those limits, nature becomes vulnerable to catastrophic consequences (Thompson et al., 1990). Human society and nature are said to be inseparable from each other. Indeed, their synthesis is seen as 'in harmony' and "necessary to everyone's wellbeing" (Ostrander, 1982, p. 26).

Although hierarchies acknowledge that irresponsible human behaviour has affected ecosystems negatively, they believe that humankind can still remedy this matter by using natural resources more sustainably (Ney & Thompson, 2011). This is similar to the border institutions view; except that the hierarchy believe that ecosystems are stable when human beings interfere with them within the boundaries discovered and determined by experts (Ney & Thompson, 2011).

While constructing holistic knowledge as the appropriate agency for learning style, border institutions promote identification with the public by framing themselves as moral agents who seek to treat ecosystems with great care (Schwarz & Thompson,

1990), permitting "life in its varied and beautiful forms to continue" (Douglas & Wildavsky, 1982, p. 135).

Border institutions identify the acts from the market and hierarchy institutions as guilty and culpable because human activities have brought disastrous physical consequences that have accelerated the extinction of countless species (Ney & Thompson, 2011). This catastrophic environmental degradation also confronts and threatens human wellbeing (Douglas & Wildavsky, 1982). Border institutions depict humankind as "standing on the very edge of the abyss of environmental catastrophe" (Thompson & Rayner, 1998, p. 294).

Border institutions therefore construct a hierarchy and social order distinct from market and hierarchy institutions. 'Ephemeral' nature (Thompson et al., 1990), where nature is constructed as fragile with depleting resources, is prevalent (Schwarz & Thompson, 1990). Border institutions suggest that everything in the natural and social world is interconnected intricately (Ney & Thompson, 2011), and that this web of life is "so complicated that even small changes could have great importance" (Douglas & Wildavsky, 1982, p. 62). For border institutions, nature and society are said to be in equal position (Douglas & Wildavsky, 1982). This is a utopian worldview of a balanced and harmonious ecosystem in which life of all forms exists "without political, economic and technological restraints" (Douglas & Wildavsky, 1982, p. 136).

6.3.1.3 Logological analysis - Properties of knowledge ideals

While constructing science as an agent and identifying nature as having abundant resources, market institutions establish 'objectivity' as the terministic screen or "symbolic god-term" (Livesey, 2002b, p. 132) with respect to the properties of their knowledge ideal and to legitimate their preferred learning style and view of nature.

According to Douglas and Wildavsky (1982), what underpins any scientific method is ostensible objectivity. Probabilistic risk calculation for instance, conveys the delusion of a value-free practice. As Douglas and Wildvasky (1982, p. 71) contend:

> Objectivity means preventing subjective values from interfering with the analysis. Put the figures in, work out the probabilities, crank the handle, and the answers will come out. … Far from being objective, the figures about

> probabilities that are put into the calculation reflect the assigner's confidence that the events are likely to occur. Since the risk analyst who feeds the machine its data is only human, he cannot focus on all prospects with an equally steady gaze.

As such, market institutions create hierarchising and separating effects producing and reproducing social divisions and inequalities in evaluating risks. According to Douglas and Wildavsky (1982), market institutions' scientific experimentations are inadequate for judging whether some risks are 'properly managed' while others are worth taking due to the subjective value of the risk analyst (Douglas & Wildavsky, 1982).

Furthermore, scientific risk analysis, more often than not, "decontextualizes and dissocialises" human problems through quantification (Douglas & Wildavsky, 1982, p. 80). Throughout the process of measuring, organising (including discriminating) and calculating, the market institution creates areas with "closely scrutinized and ordered" details, in contrast to the discriminated shadowed spots "in which nothing can be seen and no questions asked" (Douglas, 1986, p. 69). According to Douglas and Wildvasky (1982, p. 81), "science and risk assessment… explicitly try to exclude moral ideas about the good life. Where responsibility starts, they stop".

Hierarchy institutions, by constructing expert knowledge as the agent and identifying nature as stable within boundaries, use 'procedural validation' as the terministic screen with regards to properties of their knowledge ideal for legitimating their preferred social order and learning style. As Douglas (1986) contends, while hierarchy institutions insist their processes of gaining knowledge (along with that of market institutions) is consistent with mainstream science, it is extremely difficult to widen the field of knowledge, especially because it prefers to remain silent on those scientific inquiries which are in tension or contradictory. According to Douglas (1986, p. 77), "[o]ften when a new scientific discovery has been rejected and left to lie inert until later, it is precisely an idea which lacked formulaic interlocking with normal procedures of validation." As such, hierarchists construct and control institutional memory by bringing certain knowledge events to its members' minds while encouraging them to forget others (Douglas, 1986).

This case can be exemplified by US governments' position of economic hegemony in the Intergovernmental Panel on Climate Change's (IPCC) climate negotiation. US

representatives suggest that ‘global warming’ science is no more than a stumbling hypothesis to the complex questions of climate change. Human activity, from this perspective, is merely a tiny and possibly insignificant component within a colossal system. Climate change may be beneficial to promote forest and crop growth. This position from the US government creates the antagonistic relations between industrialised and developing economies in IPCC climate negotiations (Livesey, 2002b).

Evidently, hierarchy institutions create hierarchising and separating effects which (re)produce social divisions and inequities while determining what type of expert knowledge is legitimate and what kind of scientific evidence counts as credible (Ney & Thompson, 2011). According to Rayner (2012, p. 110), “institutionalised forgetfulness” is crucial to maintain institutional arrangements, and public memory as the storage system is for establishing the “social order” (Douglas, 1986, p. 70).

The paradoxes and controversies inherent in the hierarchising and separating effects derived from properties of market and hierarchy (centre) institutions’ knowledge ideal provide opportunities for border institutions to resist and transform. Through the construction of holistic knowledge as agency and identification of nature as ephemeral and fragile, border institutions establish ‘imperfection’ as the terministic screen with respect to properties of their knowledge ideal, to legitimate their preferred social order and learning style.

Since border institutions’ knowledge ideal is morally explicit, they acknowledge the “polarized and politicized” scientific community itself and make the frustrations over scientific disputes visible (Douglas & Wildavsky, 1982, p. 65). From a border institution’s perspective, market and hierarchy (centre) institutions highlight some ‘facts’ while obscuring others based on selective principles (Douglas, 1986).

> There is so much still out there [about the physical nature] capable of being established by objective scientific inquiry. Science works wonderfully; it has organized some of the facts. For the sake of coherence, the intellectual energy that develops a theoretical scheme makes grand leaps over abysses when the facts are thin. At the same time, it relegates to the background yesterday's facts, which belong in yesterday's theories (Douglas & Wildavsky, 1982, p. 72).

In other words, scientists from the centre institutions consign unused theoretical schemes to oblivion, as well as silence historical underpinnings (Douglas &

Wildavsky, 1982). As such, "feasible limits depend not on what nature will withstand but on what people will stand for" (Douglas & Wildavsky, 1982, p. 64).

While the distinctive value of centre institutions generates the basic scientific techniques of organisation, calculation and discrimination, this pertinent social order, from the perspective of the border institution, inevitably gives rise to "myopia" (Douglas & Wildavsky, 1982, p. 75). That is, non-knowledge or non-acknowledgement of the known as "uncomfortable knowledge" (Rayner, 2012, p. 107), serves as a political and ideological tool for centre institutions to impose 'involuntary risk' on society (Douglas, 1986; Douglas & Wildavsky, 1982; Rayner, 2012). "Involuntary risk" is those risks and damages caused by individuals who profit from others' ignorance. This differs from voluntary risk undertaken by individuals knowingly in order to gain benefits (Douglas & Wildavsky, 1982, p. 19).

There are various cases showing that wilful non-disclosure is due to "economic self-interest" and research funding and investments "serve to hide the truth" of potential environmental risks and pollution (Douglas & Wildavsky, 1982, p. 59). Therefore, from a border institutions' perspective, it is extant mainstream knowledge systems that causes environmental harm and fails to take prompt action (Douglas & Wildavsky, 1982).

6.3.2 Attitude towards technology, View of risk and Resolution of risk

Market, hierarchy and border institutions discursively represent diverse attitudes towards technology to motivate certain understandings of sustainable development and shape attitudes towards cooperative action. These different attitudes towards technology, in turn, lead to the identification of a different social order regarding the view of risk through different sets of discourse. These discourses or symbolic actions from market and hierarchy (centre) institutions have hierarchising and separating effects with respect to their resolution of risk. These paradoxes and controversies are challenged by border institutions through 'counter' discourses or symbolic actions (Douglas & Wildavsky, 1982; Stillar, 1998).

6.3.2.1 Grammatical analysis - Attitude towards technology

Contested attitudes towards technology in the broader context of sustainable development are constructed by market, hierarchy and border institutions through discursive practices. Market institutions are open to the view that technology is the agent of social distinction and wealth generation (Douglas & Wildavsky, 1982) because the unpredicted force of technological progress will mitigate unforeseeable harms (Thompson et al., 1990), and render the present 'fuss' over the environmental risk irrelevant in the near future (Thompson & Rayner, 1998). Market institutions' purpose is to tackle environmental risks through technology and to increase the scale of economic production. This increased scale is said to, in turn, generate more economic (and environmental) benefits to enlarge the volume and velocity of the technology as well as widen the dissemination of innovation (Thompson & Rayner, 1998). Technology is argued to facilitate "standard measures" and calculation, such as risk utility analysis (or cost-benefit analysis), in a "monetarised" economic system under the protection of legislation (Douglas & Wildavsky, 1982, p. 95).

Hierarchy institutions protect both economic growth and the environment (Douglas & Wildavsky, 1982). Like market institutions, technology as the agent is also favoured by hierarchy institutions (Douglas & Wildavsky, 1982) and that a successful environmental policy can be carried out through technical adjustments to extant institutions (Thompson & Rayner, 1998). Hierarchy institutions prefer technology which demands specialised knowledge and expertise to set up and operate (Ney & Thompson, 2011). By doing so, they protect the standard measures introduced by market institutions (Douglas & Wildavsky, 1982).

Border institutions protest against technology as the agent supported by market and hierarchy institutions (Douglas & Wildavsky, 1982). Since border institutions believe that modern technology is the main source of risk, they fear environmental pollution from dangerous technology. They insist that technologies tend to incorporate objectives, for example, economic facets only, and this solution creates difficulties when facing "social judgement" regarding environmental risks (Douglas & Wildavsky, 1982, p. 70). Border institutions hold that natural resources are priceless and cannot be measured by any risk utility analysis (Douglas & Wildavsky, 1982). Indeed, border institutions believe that, although the 'appropriate technology'

is the motto of the individualists in market institutions, they "are happy to operate at any size, to any technical specification, within their capabilities, providing it is cheap enough to make them a profit and cheerful enough to attract the punters" (Schwarz & Thompson, 1990, p. 11). Border institutions object to the 'immoral' exercise of the market and hierarchy (centre) institutions when nature is "bought and sold" (Douglas & Wildavsky, 1982, p. 67) and construct hidden dangers, emanating from technology, as an evil which will "enter and spoil" the centre institutions (Douglas & Wildavsky, 1982, p. 124). Technological pollution is representative of the "moral defects" (Douglas & Wildavsky, 1982, p. 7) that manifest an "undemocratic unresponsiveness to individual needs" (Douglas & Wildavsky, 1982, p. 149) and "unfeelingness for individual suffering" within society (Douglas & Wildavsky, 1982, p. 127).

6.3.2.2 Rhetorical analysis - View of risk

Based on the construction of technologies as the appropriate agent with respect to risk attitude, market institutions are "the ingenious, inquiring and experimenting individual" (Thompson et al., 1990, p. 62), or informed agents who challenge and tackle environmental uncertainties boldly by transforming risks into opportunities (Douglas & Wildavsky, 1982). This role of agents is enacted by market institutions through the framing of public interest in terms of economic growth and suggests that citizens do not "lower standards of living by very much in order to reduce risk a little" (Douglas & Wildavsky, 1982, p. 67). Market institutions attempt to convince the public by constructing risk aversion as the main source of danger and risk avoiders as neglectful of "the danger[s] averted by new technology, or in advance of experience, the benefits or economic growth" (Douglas & Wildavsky, 1982, pp. 27-28).

A hierarchy or social order between nature and risk attitudes is subsequently established. Market institutions construct nature as resilient and readily recoverable from any turbulence such as exploitation (Ney & Thompson, 2011), and reject the idea of limited natural resources as it perceives nature as "a raw material on which human skill, knowledge, and daring have been successfully focused" (Thompson et al., 1990, p. 62). Risk responses that fit into this environment are characterised as do not "ignore or regret uncertainties" (Douglas & Wildavsky, 1982, p. 96). Risks are

said to be opportunities ready to be exploited by entrepreneurs for individual rewards (Douglas & Wildavsky, 1982; Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson et al., 1990).

Hierarchy institutions construct sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 8). Although the market individualist risk-taking behaviour might be rational to meet human needs and wants, the overall outcome from economic growth is argued to be environmentally detrimental (Ney & Thompson, 2011; Thompson & Rayner, 1998). This statement coincides with the normative view of the border institutions, yet it differs in terms of the solution that it suggests (Thompson & Rayner, 1998). Accordingly, complete risk aversion responses are impractical. A "social upheaval" would only make things worse (Thompson & Rayner, 1998, p. 305).

Hierarchy institutions consequently establish a hierarchy or social order which constructs risk as beyond those precise boundaries knowable to relevant experts (Schwarz & Thompson, 1990). The challenge for scarce natural resources for hierarchy institutions is not to stop economic development, but to find the appropriate rules, including legislation, for stronger governance to preserve the advantages of economic growth, while leaving sufficient resources for the community (Ney & Thompson, 2011). Decision-making in the hierarchy institution is "incremental, remedial and serial" (Douglas & Wildavsky, 1982, p. 93). Hierarchies solve problems in sequence and allow a long time-span for decision-making.

While constructing market and hierarchy agents with their preferred agency - technology as guilty and culpable, border institutions promote identification by establishing themselves as moral agents who are unwilling to face irreversible catastrophic degradation (Douglas & Wildavsky, 1982). For border institutions, the confidence brought by advanced scientific development has turned into a source of risk (Douglas & Wildavsky, 1982). Irreversible risks are "explosive and unstable [with] each deviation growing larger until the environment is so altered it can never return to its original state" (Douglas & Wildavsky, 1982, p. 21). In Douglas and

Wildavsky's (1982, p. 23) words, there will be no future "if modern technology permits any fool or rogue to inflict irreversible damage".

Border institutions therefore construct a hierarchy or social order different from those from market and hierarchy institutions. Nature is constructed as dreadfully unforgiving (Schwarz & Thompson, 1990) where "unbridled economic growth" is said to exert harm on the natural environment and humankind (Douglas & Wildavsky, 1982, p. 67). Since border institutions are concerned with all possible damage and assess the long-run as "imminent" (Douglas & Wildavsky, 1982, p. 122), a radical change is proposed through the immediate adoption of the precautionary principle in its strict version (Douglas & Wildavsky, 1982). According to border institutions, this solution "has the added advantage of bringing us much nearer to the desired future-harmony with nature" (Schwarz & Thompson, 1990, p. 10).

6.3.2.3 Logological analysis - Resolution of risk

While constructing technology as an agent and identifying risk as opportunities, market institutions establish 'economic growth' as the terministic screen with respect to their resolution of risk and to legitimate their attitude towards technology and view of risk. Market institutions encourage the idea that expansion will solve all problems, including those of the environment, since its advantages are overwhelming (Douglas & Wildavsky, 1982). Market institutions are future-orientated in terms of economic benefit. They seek and take risk intentionally by calculating profits:

> [A]n individual can expect to get future rewards only if he can reasonably suppose that those in his debt will be in a position (and somehow obliged) to repay him…[For] people living together with graduated expectations for the long term,…[t]o maintain a rosy expectation of the long term they must exert continual vigilance in justifying the present system, with its delayed satisfactions (Douglas & Wildavsky, 1982, p. 86).

For example, according to Douglas and Wildavsky (1982, p. 69), risk utility analysis (or cost-benefit analysis) is a common type of risk assessment for market institutions to compare risks "by placing their costs and benefits on a common economic plane". In other words, it assumes an economic/market measure is the most appropriate for all valued objects, and that natural resources do not have any intrinsic value. This hierarchising and separating of effects produce and reproduce social divisions and

inequities. As Thompson and Rayner (1998, p. 329) contend, market institutions strongly focus on immediate returns on investments and activities, since

> competitive success depends largely on timing; planning for shifting market tastes, clinching deals at the right price, meeting delivery deadlines, or knowing when to sell pork-belly futures (Thompson & Rayner, 1998, p. 329).

Such an emphasis on short-term expectations is at odds with environmental value, which is usually long-term focused (Douglas & Wildavsky, 1982). As such, risk utility analysis masks the "moral ingredients" involved in market decision-making processes (Douglas & Wildavsky, 1982, p. 70).

Hierarchy institutions, by constructing a technical fix as the preferred act, and by identifying risks as needing to be controlled, use 'regulation' as the terministic screen with regards to their resolution of risk for legitimating their risk attitude and preferred social order. According to Douglas and Wildavsky (1982, p. 93), hierarchical decision-making involving multiple goals makes it relatively easy to "retrospectively rationalize whichever ones happen to be accomplished". "[T]he need that seems most urgent in these conditions is the one whose solution is realistically feasible" (Douglas & Wildavsky, 1982, p. 93). Standardised operating procedures or regulations facilitate this governing form and help hierarchies to "objectify, rank and manage" the potential threat (Ney & Thompson, 2011, p. 63). They "avoid attempting to know too much about future consequences" by limiting rather than of expanding data (Douglas & Wildavsky, 1982, p. 93).

More specifically, hierarchies resegregate and redefine potential damage by upgrading certain risk dimensions while downgrading and shifting others sideways (Ney & Thompson, 2011). This objectified notion of risk facilitates ignorance to certain alternatives so that attention is only given to "those best known and closest to existing prognoses" (Douglas & Wildavsky, 1982, p. 93). In this sense, hierarchists and individualists have similar views towards risk. Both are fearful of those risks which threaten the system as a whole, as well as public confidence (Douglas & Wildavsky, 1982).

As such, despite divergent views of risk between market and hierarchy institutions, both have "imperialist tendencies" which are evidenced in the expansion of the operational field through technological development to solve environmental

problems (Douglas & Wildavsky, 1982, p. 97). Subsequently, these two institutional types can coexist and collaborate to some extent (Elliott, 1983; Linsley & Shrives, 2009). According to Douglas (1990, p. 12), "market individualism needs a political base to assure its basic security...[while] hierarchical culture needs an economic base".

Hierarchy institutions with market institutions consequently create hierarchising and separating effects which (re)produce social divisions and inequities. As suggested by Douglas and Wildavsky (1982, p. 122), the construction and objectification of risk can be seen as an ideological tool used by the centre institutions to foresee "disturbances and setbacks in the normal course" and "weather" them (Douglas & Wildavsky, 1982, p. 188).

Border institutions establish 'low growth' as the terministic screen with response to their resolution of risk to legitimate their preferred social order and risk attitude (Douglas & Wildavsky, 1982; Stillar, 1998).While border institutions assess risks, they reveal their moral commitments "explicitly and prominently" (Douglas & Wildavsky, 1982, p. 73), and they attempt to bring risks to public attention forcibly (Thompson et al., 1990). Underlying this perspective is the assumption of a zero-sum game. This outlook assumes one cannot benefit except at another's' expense. Following the reasoning of a trade-off, border institutions do not acknowledge economic measures from the market (and hierarchy) institutions. Therefore, border institutions do not believe in economic expansion as an environmental solution (Douglas & Wildavsky, 1982). This argument from the border institutions shifts attention to human needs and wants. From the perspective of the border institutions, real human needs are closely aligned with the cycle of the eco-system, and are defined in both material and spiritual terms (Thompson & Rayner, 1998). While material needs cover food, shelter and clothing, the spiritual aspect embraces personal development, self-realisation and harmony with nature. Technological development implies the promise of the satisfaction of endless wants in an age of consumerism that fails to satisfy human needs (Thompson & Rayner, 1998, p. 296).

6.3.3 Cause of ecological crisis, Justice and fairness and Properties of desired system

Hierarchy and border institutions discursively represent diverse causes of the ecological crisis to motivate certain understandings of sustainable development and shape attitudes towards cooperative action. These different causes of the ecological crisis, in turn, identify different social orders regarding the view of justice and fairness, through different sets of discourse. These discourses or symbolic actions from market and hierarchy (centre) institutions have hierarchising and separating effects in respect of properties of their desired system. These paradoxes and controversies are challenged by border institutions through 'counter' discourses or symbolic actions.

6.3.3.1 Grammatical analysis - Causes of ecological crisis

Contested causes of the ecological crisis in the broader context of sustainable development are constructed by market, hierarchy and border institutions through discursive practices. For market institutions, the present "ballyhoo" over environmental issues represents "much ado about nothing" (Ney & Thompson, 2011, p. 47). Market institutions construct border institutions as 'scare mongers' who hold naïve but erroneous ideals that humans make the world better, and hierarchy institutions as misrepresenting matters in an attempt to increase their influence by expanding budgets (Ney & Thompson, 2011).

Market institutions construct hierarchical interference as a major obstacle for achieving sustainable development (Thompson & Rayner, 1998). They consider hierarchy institutions' prices for resources as distorted, often resulting from misguided government economic policy that is the cause of unsustainable development and subsequent ecological crisis (Thompson & Rayner, 1998). This is an explicitly technical argument for environmental issues that focuses primarily on the natural resource price mechanism.

Market institutions debate resource management with respect to the economic theories of "scarcity and cost" (Thompson & Rayner, 1998, p. 298). Accordingly, scarce natural resources should be valued highly to cover the increasing cost of resource planning and management activities. This scarcity, if reflected accurately in

the resource pricing scheme, influences users' decision making because of effective market forces such as; technical innovation, substitution and structural alternation (Thompson & Rayner, 1998). In order to compete in the market, strategies need to be adopted and behaviours changed by resource users.

Conversely, if a resource is undervalued, that is, its scarcity is not reflected through a resource pricing scheme, this resource will tend to be over-utilised. This is one reason why a failure to internalise environmental costs leads to environmental degradation. Market institutions therefore protect the environment through accurate and equal resource pricing mechanisms/instruments. This price mechanism/instrument is said to allocate both economic and environmental resources to users while tackling the resource degradation through increasingly efficient use. Therefore, institutional regulations or hierarchical interventions that align with the objectives of an unfettered market are advocated by market institutions (Ney & Thompson, 2011). Such regulations are said to support competition, prevent resource loss (Douglas & Wildavsky, 1982) and therefore bring overall social benefits such as technological innovation which, in turn, enlarges the production scale (Thompson & Rayner, 1998).

Hierarchy institutions construct the cause of the ecological crisis as a lack of governance and planning (Ney & Thompson, 2011). From the perspective of hierarchy institutions, economic life, in terms of resource allocation, production and consumption of goods or services, "should not be left to the free interplay of market forces" but rather subjected to the act of central planning (Ney & Thompson, 2011, p. 61). The natural resource price mechanism is perceived as a bureaucratic structure that will rectify the myopia and greed of the free market and lead to sustainable water resource management in an incremental and carefully planned manner (Ney & Thompson, 2011).

The purpose of governance, with regard to economic life and the environmental crisis, can be traced back to the hierarchists' view of nature. They do not see nature as infinitely resilient despite the fact that it serves to meet human needs and wants. While utility-maximisation may be rational for individuals, the overall results of unbridled economic growth are argued to be harmful to the environment (Thompson

& Rayner, 1998). Because "hierarchies are afraid of upheavals which escape from a rational order and they fear for the life in the organisation" (Douglas & Wildavsky, 1982, p. 91), they believe in rational management of both the economy and the environment to prevent the detrimental effects of excessive economic activity (Thompson & Rayner, 1998).

> A community works because the transactions balance out. The risk of free riding is controlled by the accounting system. The accounts are audited, and debts are collected by the way that God or nature punishes defaulters with disease and death (Douglas, 1986, p. 74).

Border institutions consider the environmental crisis as a symptom of a wider social ill. The abuse of nature is said to be fundamentally related to social structures and values (Thompson & Rayner, 1998). From this perspective, the manner in which humans pillage natural resources recklessly is a significant indicator for social malaise such as racism, gender discrimination, social alienation and so on (Ney & Thompson, 2011; Thompson & Rayner, 1998).

Border institutions construct centre institutions as "the ideological standard bearers" of a devastating socio-economic system (Thompson & Rayner, 1998, p. 304). A lack of proper governance, which is diagnosed as the root of environmental crisis from hierarchy institutions, is merely a symptom of underlying imbalances within the social world. Border institutions view the allocation of the GAB water resource in favour of market and government interests as the cause of ecological crisis. As Douglas and Wildavsky's (1982, p. 150) assert, social and environmental issues are "a confrontation between corporate [and governmental] technocratic domination and decentralized community independence". For that reason, border institutions believe that social equity is the agent to address the social imbalance in favour of justice, humanity and freedom from repression (Douglas & Wildavsky, 1982; Thompson & Rayner, 1998). Border institutions' purpose of blocking the 'unjust' allocation of natural resources is said not merely to safeguard themselves from any potential environmental crisis, but also to "break the stranglehold which they consider such interests have on society" (Douglas & Wildavsky, 1982, p. 150).

6.3.3.2 Rhetorical analysis - View of justice and fairness

Based on pricing regulation as the cause of the ecological crisis, market institutions are conveyed as competitive individuals that create extra wealth to benefit themselves and others (Thompson et al., 1990). This identity is characterised by a laissez-faire attitude that emphasises individual autonomy and freedom with respect to needs and wants (Ney & Thompson, 2011; Schwarz & Thompson, 1990).

Market institutions frame public interest as embodied in a competitive free market that will "select the best and reject the worst" (Douglas & Wildavsky, 1982, p. 99). In Thompson and Rayner's (1998, p. 300) words, "what is good for market efficiency is good for the environment, increased efficiency means less waste and a more careful use of resources". A hierarchy or social order regarding a certain view of fairness and justice is subsequently constructed. Market institutions prefer rules for fair-play (Douglas & Wildavsky, 1982) and construct fairness as "those who put the most in get the most out" (Ney & Thompson, 2011, p. 37).

Drawing upon a lack of central planning and control as the cause of ecological crisis, hierarchy institutions exploit the strategy of identification with the public interest through plans to limit present consumption and to accumulate capital for long-run benefits in terms of social and environmental justice and balance (Thompson et al., 1990). Hierarchy institutions believe fair distribution is ranked by needs (Ney & Thompson, 2011), and have confidence in "sacrificing the few for the good of the whole" (Douglas & Wildavsky, 1982, p. 101). Therefore, priority is given to the solidarity and maintenance of the system as a whole (Ney & Thompson, 2011). In the hierarchical worldview, nobility obliges. That is to say, differences of rank, status, influence, and wealth exist and are quite acceptable, as long as those at the top make a concerted, genuine effort to shelter those at the bottom from the vagaries of life (Ney & Thompson, 2011, p. 66).

While constructing an inequitable social system as the cause of ecological crisis, border institutions promote identification between themselves and the public by framing themselves as moral agents who support policies to protect the environment without "exploitative values…and dehumanised relationships" (Douglas & Wildavsky, 1982, p. 135). Border institutions identify depleting resources as a result

of the current social system and inegalitarian life-style (Thompson et al., 1990). They consequently establish another hierarchy and social order differing from those of market and hierarchy institutions.

Border institutions construct justice and fairness with regard to both human and nature interactions and social relations. They contend that human fate is inextricably connected to that of the planet earth (Ney & Thompson, 2011). For border institutions, social relationships are said to be fundamentally dependent upon "fraternal and sororal cooperation" and therefore should be "voluntaristic and egalitarian" (Schwarz & Thompson, 1990, p. 7). Encroachment of a differential social status from a hierarchical lifestyle and unequal distribution of wealth and power from market institutions threatens this ideal state of justice of border institutions (Thompson et al., 1990).

6.3.3.3 Logological analysis - Properties of desired system

While constructing government intervention as the cause of ecological crisis and identifying the concept of justice and fairness as the equality of opportunity, market institutions establish the 'free market' as the terministic screen in respect of properties of their desired system to legitimate their preferred style of justice and fairness and cause of ecological crisis.

According to Thompson and Rayner (1998), the underlying market institutions' diagnosis of an environmental crisis is linked to a capitalist system that goes hand in hand with environmental protection and necessary growth for attaining sustainable development (Thompson & Rayner, 1998). It is consistent with the assertion of Ney and Thompson (2011, p. 37): "Adam Smith's invisible hand ensure[s] that people only do well when others also benefit".

Yet market institutions, as such, do not take any responsibility for individual failures:

> Its risk portfolio does not carry heavy fixed liabilities for pensioners, widows, and orphans. It holds people responsible for their own misfortunes; stupidity and neglect explain their losses (Douglas & Wildavsky, 1982, p. 101).

Personal failures, therefore, are attributed to individual incompetence and/or bad luck, while the competitive market remains smart and guiltless (Douglas & Wildavsky, 1982).

Since market institutions espouse individual success and care for the 'bottom line' only, temporary inequalities within social groups are accepted as long as fair competition and free exchange systems are not hampered (means-end rationality). According to Douglas and Wildavsky (1982, p. 179):

> [Market institutions'] fundamental justification is not faith in the value of the individual but faith in the freedom to exchange… [l]ong term concentrations of wealth make it impossible to give honest answers to the challenge of envy: with wealth stabilised, the premise of equality is flouted.

In other words, market institutions value free competition, not the "relational niceties" of members within society (Schwarz & Thompson, 1990, p. 6).

Hierarchy institutions, by constructing loss of government control as the cause of the ecological crisis and identifying their concept of justice and fairness as equality before law, use 'governance and planning' as the terministic screen with regards to properties of their desired system, for legitimating their preferred social order and perceived cause of ecological crisis.

Although hierarchy institutions prefer to use direct instrumental rules/bureaucratic means to allocate resources by physical quantities to facilitate a top-down reallocation (Douglas & Wildavsky, 1982; Thompson et al., 1990), they tend to "adopt a limited redistributive ethic…limiting exchange so as to limit losers" (Thompson et al., 1990, p. 61).

> Hierarchy relies on explicit controls…[s]o long as information is tightly controlled, there is not much worrisome contradiction among the founding principles or incompatibility between them and the way of life they justify (Douglas & Wildavsky, 1982, p. 180).

For example, hierarchy institutions behove the affluent e.g. industrial sectors to assist vulnerable sectors for addressing environmental issues (Ney & Thompson, 2011). Therefore, hierarchy institutions tend to punish sectors responsible for economic value creation (such as industrial sectors), and reward sectors with less economic success (Ney & Thompson, 2011).

Social equity, from the perspective of hierarchy institutions, is neither possible nor necessary. Social groups are bound to each other "in an orderly and ranked relationship", while hierarchy institutions seek to coordinate these groups "without

violating status differentials" (Schwarz & Thompson, 1990, p. 6). What they attempt to create is "a procedural rationality that is more concerned with the proprieties of who does what than with trying to evaluate the outcome" (Schwarz & Thompson, 1990, pp. 6-7).

Through an inequitable system as the cause of ecological crisis, and the identification of justice and fairness as necessary for equality of conditions and results, border institutions establish 'social and environmental equity' as the terministic screen with respect to properties of their desired system for legitimating their preferred social order and cause of ecological crisis.

Border institutions believe that environmental pollution does not only occur in a physical and technical sense as it is divided between the moral and the immoral, purity and impurity, innocence and guilty to "sustain the vision of good society" (Douglas & Wildavsky, 1982, p. 37). For border institutions, pollution "carries the idea of moral defect" (Douglas & Wildavsky, 1982, p. 36) that endangers humankind (Douglas & Wildavsky, 1982, pp. 10-11):

> Put into secular terms, worldliness appears in big organization, big money, and market values all deny equality and attack goodness and purity; conspiracy includes factions plotting secret attack, transporting evil into an essentially good world.

Border institutions therefore commit to bring equality to all humankind through the guiding principle and a belief in "human goodness and the supreme value of the individual" (Douglas & Wildavsky, 1982, p. 177). Hence, border institutions' desired system demands that individuals begin as equal and end up equal (Ney & Thompson, 2011).

6.4 **Critical themes**

By applying a Burkean framework of rhetorical criticism to cultural risk theory, three accounting and accountability related themes are identified. They are the concept of control (Chapter 7, Section 7.4), stewardship (Chapter 8, Section 8.4), and economic consequences (Chapter 9, Section 9.4).

Accounting recognition and measurement relies on the concept of control. Nonetheless, this control concept and the subsequent recognition and measurement

of relevant assets and liabilities in financial reports are contestable when, what is traditionally considered a public good, becomes a resource for profit. Cultural risk theory, by suggesting different assumptions of market, hierarchy and border institutions with respect to preferred learning style, view of nature and properties of knowledge ideals shaped by institutional beliefs and interests, provide us with a critical lens to understand the contested nature of the accounting concept of control with subsequent accounting measurement and recognition rules.

Stewardship is one objective of financial reporting, derived from property rights, and is based on the idea of a principal and agent relationship. Like the concept of control, stewardship is contestable when companies are held accountable for natural resources which they control, while their business activities have environmental impacts (Jones, 2010). Cultural risk theory, by contrasting distinctive institutional assumptions of attitude towards technology, view of risk and risk resolution, provides us with the rationale to understand the debate of stewardship from both mainstream and critical accounting perspectives.

Economic consequences are understood as "the results of the reallocative outcomes" of a policy standard (Fogarty, Hussein & Ketz, 1994, p. 25). It is the economic consequences argument that is used by various constituents to push through their interests and value to influence income redistribution or resource allocation policies (Zeff, 1978). Cultural risk theory, by suggesting different institutional assumptions of the causes of ecological crisis, view of justice and fairness and properties of desired system, provides us with a critical lens to analyse the natural resource allocation debate with its related economic consequences arguments, and the further implications for accounting practices.

The application of Burkean rhetorical criticism to cultural risk theory to determine critical themes are demonstrated in Table 6.3 below.

Table 6.3 Application of Burkean Rhetorical Criticism Framework to Cultural Risk Theory to determine Critical Themes

Major Concepts	Market Institutions	Hierarchy Institutions	Border Institutions	Critical Themes
Grammatical Analysis				Concept of Control
Preferred Learning Style	Science (Trial and Error)	Expertise	Holism	
Rhetorical analysis				
View of Nature	Cornucopian and Abundant	Stable within Boundaries	Ephemeral and Fragile	
Logological Analysis				
Properties of Knowledge ideal	Objectivity	Procedural Validity	Imperfection	
Grammatical Analysis				Stewardship
Attitude towards Technology	Pro-technology	Technical Fix	Anti-Technology	
Rhetorical analysis				
View of Risk	Opportunity	Controllability	Need to Minimise	
Logological Analysis				
Resolution of Risk	Economic Growth	Regulation	Low Growth and Invasiveness	
Grammatical Analysis				Economic Consequence
Cause of Ecological Crisis	Government Intervention	Loss of Control	Inequitable System	
Rhetorical analysis				
View of Justice and Fairness	Equality of Opportunity	Equality before Law	Equality of Condition and Result	
Logological Analysis				
Properties of Desired System	Free Market	Governance and Planning	Social and Environmental equity	

Adapted from: Schwarz and Thompson (1990, pp. 66-67, see also Ney & Thompson, 2011; 1990; Thompson, 1980; Thompson et al., 1990; Thompson & Rayner, 1998)

6.5 **Summary**

This chapter represented cultural risk theory in general and the application of the Burkean framework of rhetorical criticism to cultural risk theory in particular with the implications of critical themes for accounting and accountability research. Cultural risk theory suggests that any individual risk position is influenced by cultural beliefs and values (Douglas, 1970; Douglas, 1985; Douglas & Wildavsky, 1982). This thesis utilises Douglas and Wildavsky's (1982) Risk and Cultural model to analyse institutional-biased political debate of the GAB water governance and allocation. According to Park (2010), this transdisciplinary theoretical model does

not only explicitly acknowledge diverse risk responses from different institutions but also explains policy decision-making process with respect to contested perceptions towards risk management.

This thesis investigates different positions taken by market institutions (represented by BHP and BHP OD); hierarchy institutions (represented by Australian Federal and South Australian government); and border institutions (represented by civil society), regarding the GAB water related risks from BHP OD's GAB water extraction and its further proposal of ODEP. Cultural risk theory informs an exploration of the underlying assumptions of the contentious water related disclosure and accountability discourses by three institutions and analyses their role in incorporating economic, social and environmental accountability into a transdisciplinary dialogue.

Since cultural risk theory is concerned with how risk is mediated and "politicalized" through cultural patterns and beliefs (Douglas, 1992, p. 29), it provides us with an enabling and emancipatory conceptualisation to understand why different institutions (BHP and BHP OD; Australian Federal and South Australian government; and civil society) support different GAB water governance policies and why they focus on different policy issues regarding risk-based GAB water sustainability. Specifically, it facilitates an understanding of how risk discourses and strategies are operated within centre institutions (e.g. BHP, BHP OD, Australian Federal and South Australian governments), and how they are negotiated and resisted by the border institutions (e.g. civil society).

In this chapter, the three-fold Burkean framework of rhetorical criticism is applied to cultural risk theory to identify features, functions and implications of each institutional group's risk discourses. Major concepts of cultural risk theory are thereby made explicit. They are preferred learning style (feature), view of nature (function), property of knowledge ideal (implication), attitude towards technology (feature), view of risk (function), risk resolution (implication), cause of ecological crisis (feature), view of justice and fairness (function) and property of desired system (implication).

These nine concepts are also linked to three accounting and accountability themes - Preferred learning style, view of nature and property of knowledge ideals from three

institutions help to understand the contested nature of accounting concept of control with associated accounting recognition and measurement rules. Institutional assumptions about the attitude towards technology, and a view of risk and risk resolution, facilitate the understanding of the stewardship debate from both mainstream and critical accounting perspectives. Institutional perceptions of the cause of the ecological crisis, view of justice and fairness and property of desired system enable an analysis of the resource allocation issue and its associated economic consequences arguments, to further understand accounting and accountability. These theoretical concepts with accounting themes provide analytical scaffolding which facilitates interpretation of the GAB water risk debate in Chapter 7, 8 and 9.

CHAPTER 7 PREFERRED LEARNING STYLE, VIEW OF NATURE AND PROPERTY OF KNOWLEDGE IDEAL

7.1 Introduction

The preceding chapter introduced cultural risk theory (Douglas & Wildavsky, 1982), with the application of a Burkean framework of rhetorical criticism that supports the analysis and interpretation of institutional disclosures in respect of the Great Artesian Basin (GAB). This chapter applies three major concepts from cultural risk theory-preferred learning style, view of nature and properties of knowledge ideal to analyse: market - BHP Billiton (BHP) and BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD); hierarchy - Australian Federal and South Australian government; and, border institutions' - civil society viewpoints manifest in their disclosure documents in the context of GAB water-related risks.

According to Burkean grammatical analysis, institutions display heterogeneous learning styles to understand nature as they retain certain knowledge while omitting other (Douglas & Wildavsky, 1982). According to Burkean rhetorical analysis, these different learning styles subsequently establish "self-consistent version[s]" of nature and inform a corresponding social order (Rayner, 2012, p. 107). In the logological analysis, symbolic actions in the form of discourse from market and hierarchy (centre) institutions give rise to hierarchising and separating effects with respect to the property of their knowledge ideals, which "direct our attention toward certain features of our environment and away from others" (Thompson et al., 1990, p. 28).

The purpose of the analysis is to identify different institutional perspectives with regard to preferred learning style, view of the GAB groundwater system and property of knowledge ideal. This analysis has implications for an understanding of the accounting concept of control with respect to natural resources from both a mainstream and critical perspective. This concept and the subsequent recognition and measurement of relevant assets and liabilities in financial reports are contestable when what is considered a public good becomes a resource for profit. The three-levelled analysis of different institutional perspectives and critical themes of accounting and related accountability are displayed in Table 7.1.

Table 7.1 Preferred Learning Style, View of Nature, Properties of Knowledge Ideal and Concept of Control

	Market Institutions	Hierarchy Institutions	Border Institutions
Grammatical Analysis (Discursive features)			
Preferred Learning Style	Science (Trial and Error)	Expertise	Holism
	Implement modelling studies subject to evolving learning process to control the potential decline of spring flows for sustainable GAB water extraction	Trust expert knowledge and use scientific research to understand rechargeability of the GAB and determine its water balance	Believe the assumption of rechargeability of the GAB is flawed and BHP OD's modelling studies are faulty due to simplistic models and limited data. Holistic knowledge is desired
Control	BHP OD's GAB water extraction does not entail a 'liability' as the potential water extraction related risk is trivial and uncertain, sanctioned by South Australian government		BHP OD has responsibility for environmental damage, such as declining spring flow
Rhetorical Analysis (Discursive functions)			
View of Nature	Cornucopian and Abundant	Stable within boundaries	Ephemeral and Fragile
	GAB is rechargeable and BHP OD's GAB water extraction only makes up of a small part of total GAB water storage. Humans are masters of nature	GAB is rechargeable with a slow recharge rate. The current GAB water extraction from BHP OD is within 'sustainable yield'. Significant cultural synthesis of the GAB with the wellbeing of the inhabitant	GAB is a fragile and non-rechargeable water resource. It intricately connects to the wellbeing of human and non-human inhabitants. BHP OD's water extraction negatively affects the GAB water system
Control	GAB water intake for BHP OD's mining operation not recognised as an asset because South Australian government grants it the water licence without charge. Unmeasurable 'asset' is unidentifiable in monetary terms		Recognition and presentation of the obligation that BHP OD has towards the GAB water extraction. Disclosure of the likelihood of a non- rechargeable GAB
Logological Analysis (Discursive implications)			
Properties of Knowledge Ideal	Objectivity	Procedural Validity	Imperfection
	Ostensible objectivity underlying scientific method is achieved by ignoring moral and ethical dimensions of the GAB water extraction	Procedural validity underlying scientific method is achieved by silencing contradictory scientific studies about the likelihood of non-rechargeability of the GAB	Scientific and expert knowledge as limited and incomplete because of its evolving nature. BHP OD and governments' wilful ignorance of counter scientific inquiries in the pursuit of economic self-interest is unethical
Control	Mainstream accounting system serves as an ideological tool for a vested interest to overuse non-renewable resources and downplay the ecological impacts		Critical accounting requires GAB water extraction related risks as a (contingent) liability to be recognised in BHP OD's financial reports, stipulated by South Australian government
Accountability	Managerial accountability	Administrative Accountability	Moral Accountability
	Social and environmental benefits and costs are immaterial, unquantifiable and unmeasurable in the free market	Increasing concern with economic growth thus passing more power to the market	A more encompassing form of accountability to acknowledge a relationship of obligation to or responsibility for the other which cannot be discharged by mere reference to one's economic interest. It cultivates openness and dialogue for social and distributive justice rather than scientific economic reasoning
	Main focus on the scientific and technical dimensions of accountability, neglecting the full social and environmental costs		

The chapter begins with an analysis of the preferred learning style, view of nature and property of knowledge ideal of the market and hierarchy (centre) institutions (Section 7.2) before the explication of those of the border institutions (Section 7.3). The concept of control and associated issues of accountability is then discussed with insights for financial accounting-standard setting in the era of impending environmental crisis (Section 7.4).

7.2 Preferred learning style, View of nature and Property of knowledge ideal of the centre institutions

As documents issued by BHP OD and Australian Federal and South Australian governments are cross cited and overlapping to a great extent, perspectives from market and hierarchy institutions are combined to provide a consistent view from centre institutions. As Douglas and Wildavsky (1982) argue, centre institutions incorporate market and hierarchy cultures with only a few exceptions in this case. In regards to preferred learning style, both market and hierarchy institutions believe in expert knowledge to control risk, such as mainstream science, (Douglas & Wildavsky, 1982; Ney & Thompson, 2011) which is subject to continuous trial and error in an evolving process (Douglas & Wildavsky, 1982). In terms of the view of nature, market institutions advocate an image of a robust natural world with abundant resources which can be utilised by human ingenuity (Ney & Thompson, 2011; Ostrander, 1982), while hierarchy institutions stipulate a stable and resilient nature when the natural resource is used sustainably within knowable limits (Ney & Thompson, 2011; Schwarz & Thompson, 1990). In respect of property of knowledge ideals, the market institutions' faith in risk probability quantification excludes the moral dimension of the risk (Douglas & Wildavsky, 1982), whereas hierarchy institutions adopt a similar bias in determining what type of expert knowledge is legitimate and what kind of scientific evidence counts as credible (Ney & Thompson, 2011).

7.2.1 Grammatical analysis - Preferred learning style of centre institutions

Contested learning styles in the broader context of sustainable development are constructed by market, hierarchy and border institutions through discursive practices. According to Douglas and Wildavsky (1982), the centre institutions have a preferred learning style that is grounded in expert knowledge, such as mainstream science, to

control risks. Hierarchy institutions construct themselves as agents whose role is to identify the boundary between equilibrium and disequilibrium zones, since it believes that the ecosystem is stable within certain limits through human interaction (Thompson et al., 1990). In this case, the concept of rechargeable GAB water aquifers is crucial for Australian Federal and South Australian governments to reinforce the ideal of a manageable system for water extraction.

Governments trust experts to discover and determine natural limits and predict certainty (Schwarz & Thompson, 1990), Therefore, their learning style tends to collude with that of BHP OD since the market institutions support the development of modern science as the agency to control GAB water extraction related water risks (Douglas & Wildavsky, 1982).

Scientific studies have supported GAB's rechargeability and demonstrated that it is an open system with continuous flow that is evidenced by the progressive ageing of water from the recharge to discharge area (South Australia, Legislative Council, 2005). For example, The Hon. T.G. Roberts (South Australia, Legislative Council, 2005, p. 3417) verifies that:

> A considerable body of research has been conducted by the Bureau of Rural Sciences in Canberra, on its [the GAB's] recharge, flow and discharge processes and hydrochemistry, which indicates that it is an open system and recharge is occurring. Ongoing research and investigation into the recharge processes is being conducted in Queensland and this study also shows modern recharge is still occurring.

More specifically, the Queensland Government website presents a diagram (Figure 7.1) to demonstrate how the GAB aquifer is refilled by rainfall. Diagram or "visual epigraph", according to Davison (Davison, 2011, p. 129), has rhetorical effects. It is used in this case for hierarchy institutions to promote the construction of a 'rechargeable' GAB.

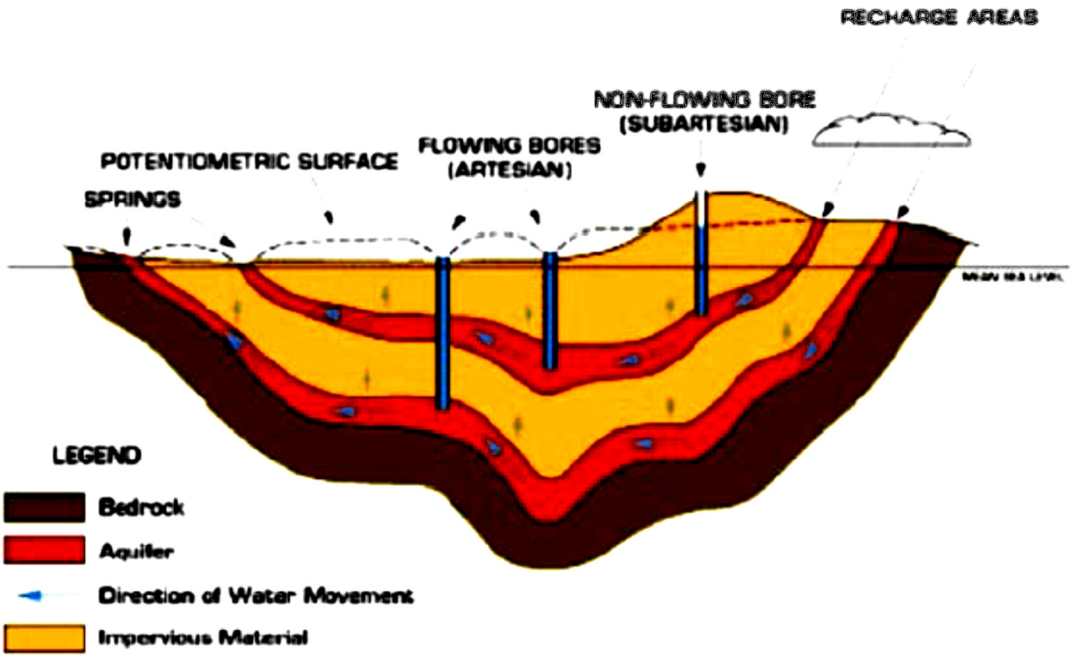

Figure 7.1 Why an Artesian Bore Flows

Source: Queensland Department of Natural Resource (DNR) (in Endersbee, 2000b, n.p.)

Following this diagram, the explanation confirms that:

> 'Artesian' water is underground water confined and pressurised within a porous and permeable unit, an aquifer. The aquifers of the Great Artesian Basin consist of permeable sandstones. These aquifers are recharged by rainfall infiltrating into the uplifted and exposed sandstones on the edge of the basin. Recharge waters slowly move down through the sandstone, filling the aquifer to the level of the intake area. As the aquifer is confined by an overlying impermeable unit, the water becomes pressurised. When a bore is drilled into the aquifer, the water will rise due to this pressure (Queensland Department of Natural Resource (DNR) in Endersbee, 2000b, n.p.).

As such, Australian Federal and South Australian governments are 'undaunted' by scientific research in an effort to understand GAB's hydrogeochemistry and rechargeability. This implies an unshakable faith in expert predictions for "a comprehensive, objective and balanced view of the subjective matter" (Ney & Thompson, 2011, p. 65). Such a learning style is based on the assumption that certified experts can generate objective and 'true' knowledge on which they often agree (Ney & Thompson, 2011) that is consistent with various scientific results that support the rechargeability of the GAB.

For example, with regard to the GAB water balance, there was "a revised numerical assessment of the groundwater flow characteristics of the GAB" published by the Bureau of Rural Sciences in 2000 which showed that "the steady-state water balance was calculated at 3.21 GL/d [Giga-litre/day]" (Welsh, 2000 in BHP Billiton Olympic Dam Corporation Pty Ltd., 2012a, p. 2). This balance was "in close agreement with the results of the previous major basin-wide groundwater flow model that indicated a recharge rate of 3.02GL/d" (Habermehl, 1980 in BHP Billiton Olympic Dam Corporation Pty Ltd., 2012a, p. 2). Based on these research results, the South Australia groundwater budget is determined:

> The Water Allocation Plan (WAP) describes the groundwater budget set for the GAB resource in South Australia. The WAP estimates 471 ML/d as inflow into South Australia with estimated outflows in 2003 of 66 ML/d from springs, 128 ML/d from wells, vertical leakage into overlying sedimentary formations of 274 ML/d per day and 3 ML/d from horizontal flow (South Australian Arid Lands Natural Resources (SAALNRM) Board, 2009, in Torrisi & Trotta, 2009, p. 195).

It is important to note here that BHP OD also cites research from both Australian Federal and South Australian governments, which indicates that centre institutions process 'valid information' from the authority of science and expertise (Douglas & Wildavsky, 1982; Ney & Thompson, 2011).

Consistent with the government's learning style, BHP OD also relies on existing expert/scientific knowledge (Douglas & Wildavsky, 1982) to privilege the rechargeability aspect of the GAB. Based on the assumption of an equilibrium/steady-state condition, BHP OD has developed modelling studies and corresponding programs to control and manage the potential decline rate of the spring flow to achieve sustainable GAB water extraction. These acts are characteristic of the "bold experimentation in the face of uncertainty" seen in market institutions (Thompson et al., 1990, p. 27). Quantification is constructed as "a method of stating problems" (Douglas & Wildavsky, 1982, p. 101) that is manifest in the construction of risk probability (Douglas & Wildavsky, 1982). This type of learning style is subject to a continuously evolving and updated process (Douglas & Wildavsky, 1982) that is sanctioned by the South Australian government as it also relies on professional knowledge to determine the limits of water extraction within which the GAB eco-system remains stable.

Modelling studies commissioned by the government are relied on and used to further the argument for BHP OD. For example, a Technical Works Program required by the then SA Minister Weatherhill to enhance Olympic Dam's "existing hydrogeological understanding, monitoring and model by means of review and improvement" is cited by BHP OD (2010a, p. 62). In response, BHP OD indicates that in order to "stimulate groundwater flow in the south-west GAB and the influence of the wellfields supplying water to Olympic Dam and Roxby Township", it has created "several groundwater models, from the initial GAB 95 model, through successive improvements and more and better data to the ODEX model families" for more than 15 years (BHP Billiton Olympic Dam Corporation Pty Ltd., 2012f, p. 10).

Computer modelling combined with water monitoring and management data are used to control the negative effects of GAB water extraction from wellfields A and B on the GAB springs within hydrogeological zones (Torrisi & Trotta, 2009). BHP OD in its Environmental Impact Statements of 1982 [37] and 1997 made predictions of the extent of spring flow reductions due to the wellfield operation (BHP Billiton Olympic Dam Corporation Pty Ltd., 2012b). According to Douglas and Wildvasky (1982), scientific development is subject to trial and error due to false assumptions, defective measures, faulty data, and poorly conducted experiments. In this case, BHP OD's modelling is limited to a hydrogeological understanding at the time of the estimation and is therefore prone to error in predictive models.

For example, in Kinhill Engineers Pty Ltd's[38] (thereafter Kinhill) (1982) ODEP Draft EIS, a computer-generated model was applied to predict the artesian flow reductions in response to water abstraction from Olympic Dam wellfields. According to the Draft EIS, 33 ML/day was expected to be extracted from wellfields A and B. However, just one year later, Kinhill's (1983, p. 60) ODEP Supplementary EIS recognised the limitations of hydrogeological and ecological knowledge:

[37] Kinhill (1982) Draft EIS, Kinhill (1983) Supplementary EIS and Kinhill (1984) are closely associated documents. The computer model used for spring flow prediction in Kinhill (1982) therefore, is supposed to be the one used in Kinhill (1983) and Kinhill (1984) without major revision. It is also evident in the predicted spring flow presented in Table 4 "Estimates of Reduction in Bore Discharge, 1982" (Keane, 1997, p. 43), Table 5 "Estimates of Reduction in Spring Discharge, 1982"(Keane, 1997, p. 44) and Table 7 "Predicted and actual impacts on WMC monitored spring groups and observed impacts on endemic mound spring fauna" (Keane, 1997, p. 46) and BHP OD is supposed to take actions if monitoring evidence show those predictions are exceeded (BHP Billiton Olympic Dam Corporation Pty Ltd., 2010a).

[38] Kinhill Engineers Pty Ltd, used to be under the name of Kinhill-Stearns Roger or Kinhill Stearns Pty Ltd is an American company which prepared EIS and SEIS of ODEP 1982 and 1997 for the then western Mining Corporation (Olympic Dam Corporation) Pty Ltd, now BHP Billiton Olympic Dam Corporation Pty Ltd.

> Joint Venturers recognize that concern exists in respect of the effect of the water supply borefields on the mound springs. They have therefore in consultation with the relevant specialists prepared a programme that will enable a more detailed assessment of these effects. It is recognized that the present level of knowledge of both hydrogeological and ecological aspects of the springs and the southern portion of the GAB is limited.

Despite this limited knowledge and insufficient data, wellfield A was developed and operations were commenced in the vicinity of the mound springs (Keane, 1997).

More than a decade later, in Kinhill's (1997, p. 18) ODEP EIS summary, it was acknowledged that BHP OD's water extraction had caused adverse impact on certain groups of mound springs: "[r]ecently, water abstraction by WMC has been identified as the probable cause of an adverse habitat change at the Bopeechee and Hermit Springs spring groups." This environmental harm is evident in Table 7.2 (sourced from Keane (1997, p. 46), which shows the difference between the predicted flow reduction in 1984 and the actual monitoring results in 1995.

Table 7.2 Predicted and Actual Impacts on WMC Monitored Spring Groups and Observed Impacts on Endemic Mound Spring Fauna

Spring Complex	Spring group	Flow change		Observed change in endemic fauna
		Predicted flow reduction, 1984	Actual, 1995	
Hermit Hill	Venable (bore)	100%	100%	total loss of endemic fauna 1991 (extinct)
	Bopeechee	20-30%	43%	decline in all endemic fauna
	Bopeechee (bore)	80%	80%	-
	Dead Boy	10-17%	no recording	decline in all endemic fauna
	Sulphuric	8-15%	insufficient data	decline in all endemic fauna
	West Finniss	10-13%	no or insufficient data	decline in all endemic fauna
	West Finniss (bore)	no data	20%	-
	Hermit Springs	5-33%	no or insufficient data	decline in all endemic fauna
	Hermit (bore)	no data	36%	-
	Old Woman	<3%	no or insufficient data	decline in all endemic fauna
	Old Finniss	<2%	no or insufficient data	decline in all endemic fauna
Lake Eyre	Goose	5-25%	no or insufficient data	ostracods present, insufficient data to analyse trends
	Priscilla	60-75%	100%	Total loss of endemic fauna
Wangiana	Davenport	1-10%	Virtually zero at one spring recording[2]	decline in all endemic fauna
Coward	Blanche Cup	no data	no data	-

Source: ODO Expansion Project EIS (1997, in Keane, 1997, p. 46)

From the above table, the spring flow prediction in 1984 indicated that the discharge rate of mound springs from the Bopeechee spring group would decline 20-30% over the following decade. In the actual data reported in 1995, however, the discharge rate for Bopeechee spring group had declined by 43%. Therefore, it is clear that BHP OD's knowledge and learning style is characterised by uncertainty, which is likely to be improved only through continuous trial and error.

Apart from the limitations in hydrogeological and ecological knowledge, Kinhill (1997) reports that the initial modelling studies used for predicting spring flow decline rate in the Draft EIS for ODEP 1982 (Kinhill, 1982) was based on an extraction rate of 6 ML/d from Wellfield A. Yet in reality, the extraction rate was up to 15 ML/d. To remedy this impact, "the reinjection of water adjacent to these spring groups and a reduction since November 1996 in water abstraction in Borefield A from 15 ML/d to 6 ML/d" has been implemented (Kinhill, (ODEP EIS Summary) 1997, p. 18). The hydrogeological relationship has been revised to cover "a planning period of twenty years to the year 2016…using an updated hydrogeological model and recently acquired data to assess compliance with requirements of the special water licences" (Kinhill, (ODEP EIS Summary) 1997, p. 10; see also BHP Billiton Olympic Dam Corporation Pty Ltd., 2012b).

Available disclosures suggest that the on-going monitoring program presents both consistent and inconsistent results within the predicted trend against the benchmark of predicted declines of spring flow made in Kinhill (1984) and Kinhill (1997). Consistent results are documented by BHP OD, such as "[t]he GAB spring flow rates in the area remained stable or rose slightly during the reporting period, and remain consistent with historical averages" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2008a, p. 25; 2009a, p. 29; see also BHP Billiton Olympic Dam Corporation Pty Ltd., 2010a; 2012a).

Uncertainties also arise from the enhanced, but still incomplete knowledge about hydrogeology and ecology. For example, "[s]pring flow is naturally variable and inherent conditions make accurate flow measurements difficult" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2012b, p. 9).

As a result, inconsistent monitoring data falling outside historical trends also exist. For example, in respect of the Spring flow rate recorded by HBS004, a monitoring bore to measure Beatrice spring flow, BHP OD (2008a, pp. 47-48) indicates that;

> [d]ue at least in part to changes in the flow measurement method and the morphology of the spring, the recorded flow rate at HBS004 since monitoring resumed is significantly less than that previously recorded. The recorded flow rate in April 2008 was again lower than the previous two measurements.

According to BHP OD (2009a, p. 52), "[t]he recorded flow rate in April 2009 was again lower than previous measurements by Land Use Consultants". Therefore, uncertainty regarding the potential impact on the spring flow from the Olympic Dam wellfields is likely to occur due to the ever-evolving understanding of the hydrogeological and ecological relationship.

To conclude the grammatical analysis, the hierarchy institutions - the Australian Federal and South Australian governments trust expert knowledge and use scientific research to understand the rechargeability of the GAB and to determine its water balance. As a sound basis, the market institution (BHP OD) implements modelling studies to control the potential decline of spring flows for its sustainable GAB water extraction. While both governments and BHP OD support the development of modern science to control and manage the GAB water related risks, both accept that this is an evolving learning process and therefore subject to trial and error (Douglas & Wildavsky, 1982).

7.2.2 Rhetorical analysis - View of nature of centre institutions

Based on the information from science and experts as the appropriate agency of learning style, centre institutions - Australian Federal and South Australian governments and BHP OD establish the view that the GAB is an open system that is replenished through rainfall.

BHP OD, as the market institution, frames the public interest as consistent with "a wonderfully robust and bountiful natural world" (Ney & Thompson, 2011, p. 48) with abundant water resources from the GAB. Torrisi and Trotta (2009, p. 195) for example, despite describing South Australia as "the driest state of the driest inhabited continent in the world", assert that GAB underground water storage is "a completely unexpected feature for such an arid climate". Accordingly, BHP OD (2012a, p. 2 also 2008a, 2009a, 2010a, 2011a, 2013a) describes the GAB as "one of the world's largest groundwater reservoirs, covering a total area in excess of 1.7 million km², of which approximately 350,000 km² lies in South Australia".

Hierarchy institutions - Australian Federal and South Australian governments, on the other hand, construct the GAB as a scarce resource (Schwarz & Thompson, 1990) in a broad arid environment with increased water demand and slow groundwater

movement. For example, according to the SAALNRM Board (2009a, p. 1), "Olympic Dam is located in the arid region of South Australia with low, erratic and infrequent rainfall". It is an area where "[l]ong dry periods occur. Evaporation is extremely high, ranging from 2400 to over 3700 Millilitre/y…[which] significantly exceeds rainfall".

The South Australian government acknowledges that the GAB water resource has become increasingly scarce due to increasing water demands for expanding mineral exploration and development. For example, Natural Resources Committee member Mr Van Holst Pelle-Kaan states that;

> [d]evelopment projections indicate the GAB will account for 10 per cent of all water use in South Australia by 2016 -— which, as we know, is not very far away - Current board projects indicate the resource is in decline over the long term; with recharge lower than discharge. (South Australia, House of Assembly 2011a, p. 3227)

This higher discharge rate compared to the recharge rate of the GAB is evidenced in a more recent report issued by Bureau of Rural Sciences, claiming that "[the GAB's] recharge rates range from 0.5mm to 10mm per year, with a maximum of approximately 40mm per year" (Habermehl et al., 2009, in Great Artesian Basin Protection Group, 2009c, n.p.).

Regarding the South Australia proportion of the GAB, the SAALNRM Board (2009a, p. 13) mentions that the water balance components are not actually 'balanced'- as the "basin-wide outflows still exceed the inflows".

In addition, the SAALNRM Board (2009a, p. 28) emphasises that, since the impact of increased GAB water discharge, the low-hydraulic conductivity of "the 'sustainable yield' should not strictly be equated to the basin recharge".

By recognising the GAB water resource as scarce, Australian Federal and State governments introduce the concept of controllability. In other words, hierarchy institutions exploit the strategy of identification with the public interest by constructing a view of responsible agents that protect nature within ecological boundaries (Thompson et al., 1990). In this case, the GAB water system has the potential for stability if it is managed within certain limits. This is congruent with

the market institution (BHP OD's) construction of a resilient and "[b]enign" (Ney & Thompson, 2011, p. 48) GAB water system where water extraction generally does not have an overall negative impact while under the management arrangement it has with government.

According to The Hon. T.G. Roberts (South Australia, legislative Council, 2005, p. 3417), "hydrogeological understanding of the Basin is … accepted as a sound basis for the setting of water use and management arrangements for the Basin." The Hon. G.E. Gago (South Australia, Legislative Council, 2011, p. 4) refers to the WAP (Water Allocation Plan) for the Far North Prescribed Wells Area issued by the SAALNRM Board (2009a), to illustrate that "at least 350 mega litres per day of water can be sustainably extracted from the South Australia section of the GAB. The BHP B[illiton] allocation is well within that range."

Representing the voice of BHP OD, the Australian Uranium Association (2009) suggests that BHP OD's total water extraction only comprises a very small if not negligible amount of total water stored within the GAB. For example;

> [h]istorically, Olympic Dam has been a relatively large user of ground water drawn from the GAB, but using small amounts in absolute terms when considering the size of the reservoir… Olympic Dam's daily extraction limit of 42ML/d represents a small percentage - less that 3% - of the natural daily outflow from the Basin; and a tiny proportion of the overall volume of the GAB (Australian Uranium Association, 2009, p. 5).

For hierarchy institutions, nature and human society are constructed as inseparable with the synthesis of nature and culture in harmony and "necessary to everyone's wellbeing" (Ostrander, 1982, p. 26). The SAALNRM Board (2009a, p. 15), for example, contends that the mound springs of the GAB "are of immense cultural importance" and they "have been a focus for human activity throughout history." These mound springs play a very important role for Aboriginal people both economically and culturally.

> Traditionally, Aboriginal people have a strong connection with their land and the resources found within it. Water is an important aspect of this connection, providing food in the form of fish, mussels and plants, a source of drinking water…Commonly associated with the mound spring are rich complexes of archaeological sites and intricately woven webs of myth and song, which demonstrate that these springs were, and are, a vital part of the cultural landscape (SAALNRM Board, 2009a, p. 21).

Additionally, mound springs have been "inextricably entwined with the livelihoods and social structure of the inhabitants of the land" since early European settlement, and they are "critical" to "the viability of the pastoral, mining and tourist industries in the region" (SAALNRM Board, 2009a, p. 1).

According to Schwarz and Thompson (1990, p. 65) and Thompson et al. (1990, p. 28), hierarchy institutions establish a myth of nature as "perverse/tolerant". Since the South Australian government believes that the GAB water system is both delicate and resilient, it acknowledges that irresponsible water extraction could affect GAB water ecosystems negatively. However, this matter can still be remediated by using the water resource more sustainably. For example, to ensure secure environmental flows to GAB springs, the *Roxby Downs (Indenture Ratification) Act* 1982 was issued by the South Australian government to regulate the Olympic Dam mine (Torrisi & Trotta, 2009). This Act requires the implementation of a monitoring program with respect to the GAB spring flow. The purpose of the program is to "[d]etermine the extent of flow change at GAB springs within each hydrogeological zone of impact that may be attributed to water abstraction from Wellfields A and B" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2010a, p. 55).

As a response, BHP OD agrees that water extraction from the GAB is likely to affect the spring flow in local areas of wellfields through reduced artesian pressure if not managed properly (BHP Billiton Olympic Dam Corporation Pty Ltd., 2008b, 2012b). Therefore, the monitoring program implemented by BHP OD under legislative requirements conveys the market institution's image of an intelligent and informed agent that conquers and improves natural resources based on ingenuity (Ostrander, 1982). For example, according to BHP OD (2013a, p. 46, see also BHP Billiton Olympic Dam Corporation Pty Ltd., 2012a):

> A core group of 41 GAB springs in the vicinity of the wellfields are monitored every six months…[to] [d]etermine the extent of flow change at GAB springs within each hydrogeological zone of impact that may be attributed to water abstraction from Wellfields A and B.

This statement of 'a core group' implies that some springs are more significant than others. This attitude is sanctioned by the South Australian government despite its

acknowledgement of the cultural significance of the mound springs. For example, as SAALNRM (2009a, p. 15) demonstrates:

> A number of springs in South Australia are recognised for their ecological and social value - namely the Dalhousie, Coward, Hermit Hill and Neales River Spring Complexes, all of which have been listed on the register of the National Estate, reflecting their national significance.

This indicates that humans are capable of privileging some elements of nature, and that some elements can be separated from others. This instrumental view of nature silences a more holistic spiritual and cultural value of the mound springs from Aboriginal groups. While preserving some mound springs, they are, at the same time, preparing the public/society for the loss of some 'unimportant' springs in exchange for economic benefits that the mining industry brings (Keane, 1997).

This attitude is also evident with regard to those relatively 'significant' monitored springs: "[Out of 41 monitored springs] 15% of the 41 springs contribute 77% of the total flow. 60% of the monitored springs contribute less than 5% to the total flow" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2013a, p. 2). However, "overall variation in reported spring flows appear to be large for small flows and decrease with increasing reported flows" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2013a, p. 48). That is, "errors/uncertainties in small spring flows, relative to the reported values, are considerably higher for small springs" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2013a, p. 2). Therefore, "there is…an opportunity to analyse and report spring flow and bore data in a more integrated way, possibly concentrating on the large spring flows initially" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2013a, p. 2).

To conclude the rhetorical analysis, the centre institutions - both BHP OD and Australian Federal and South Australian governments - construct a rechargeable GAB. The governments hold that the GAB water resource is controllable within limits - and the current level of BHP OD's water extraction is within a 'sustainable yield' range. This supports BHP OD's view that its water extraction only makes up of a very small part of the total GAB water storage. Furthermore, the South Australian government emphasises the significance of the cultural synthesis of the GAB with the livelihood and wellbeing of inhabitants. In accordance with BHP

OD's perspective that humans are the masters of nature, this position allows the centre institutions to decide which parts of the natural environmental are preserved and also the best use of GAB water for economic benefits.

7.2.3 Logological analysis - Properties of knowledge ideal of centre institutions

While constructing science and expertise as agency and identifying nature as resilient and knowable within boundaries, centre institutions establish 'objectivity' and 'procedural validation' as terminstic screens. With respect to the property of their knowledge ideal, this perspective legitimates their preferred learning style and view of nature.

While the hierarchy insists on gaining knowledge about the rechargeability of the GAB that is consistent with mainstream science, it is difficult for it to widen its field of knowledge (Douglas, 1986). As Douglas (1986) asserts, hierarchy institutions prefer to silence those scientific studies that are in tension or contradictory. Mudd (2000) for example, points out that the assumption of a 'rechargeable GAB' is based on current hydrogeological understanding, where "the recharge areas are known to be at full piezometric pressure, suggesting abundant and continuous recharge…[but] no quantitative field studies of recharge are yet available". Therefore, estimates of total inflow are merely derived from "some analytical techniques, assumed hydrogeological properties and observed artesian pressures" (Mudd, 2000, p. 465). Since the inflow data obtained to date is inconclusive and can only be understood as estimates, it may be subject to significant errors. For example, Mudd (2000, p. 466) draws on Hillier (1996) and cautions that "the perceived steady-state condition may be a balance between outflow and transmission of water through the GAB aquifers rather than recharge."

However, this assumption of a 'non-rechargeable' GAB is notably absent in Australian Federal or South Australian governments' documents (more details see Section 7.3.1). According to Douglas (1986, p. 77), "[o]ften when a new scientific discovery has been rejected and left to lie inert until later, it is precisely an idea which lacked formulaic interlocking with normal procedures of validation." As such, hierarchy institutions construct and control "institutional memory" (Rayner, 2012, p. 108) by directing attention to a particular knowledge about the rechargeability of the

GAB while ignoring others. Evidently, hierarchy institutions create hierarchising and separating effects which (re)produce social divisions and inequities while determining what type of expert knowledge constitutes a legitimate fact and what kind of scientific evidence counts as credible (Ney & Thompson, 2011). According to Rayner (2012, p. 110), the "institutionalised forgetfulness" is crucial to maintain institutional arrangements and public memory as the storage system for establishing the "social order" (Douglas, 1986, p. 70).

Likewise, what underpins the market institutions' scientific methods is ostensible objectivity (Douglas & Wildavsky, 1982). BHO OD's modelling studies for predictions of declined spring flow, for example, convey the image of an objective and value-free practice for 'proper management' of GAB water extraction. A trust in quantification is also manifested through the scientific process of monitoring, measuring, organising and calculating. As Douglas and Wildvasky (1982, p. 71) contend:

> Objectivity means preventing subjective values from interfering with the analysis. Put the figures in, work out the probabilities, crank the handle, and the answers will come out. … Far from being objective, the figures about probabilities that are put into the calculation reflect the assigner's confidence that the events are likely to occur. Since the risk analyst who feeds the machine its data is only human, he cannot focus on all prospects with an equally steady gaze.

As such, market institutions create hierarchising and separating effects producing and reproducing social divisions and inequalities through the techniques of risk analysis. According to Douglas and Wildavsky (1982), market institutions' scientific experimentations are inadequate for judging whether some risks are 'properly managed' while others are worth taking due to the subjective value of the risk analyst (Douglas & Wildavsky, 1982).

Furthermore, scientific risk analysis more often than not, "decontextualizes and dissocialises" human problems through quantification (Douglas & Wildavsky, 1982, p. 80). Throughout the process of measuring, organising (including discriminating) and calculating; BHP OD creates areas with ordered and scrutinised details, while discriminates "shadowed" spots with nothing to see and no questions to ask (Douglas, 1986). Such shadowed spots include holistic views and moral concepts such as whether the spiritual and cultural value of the mound springs should be

sacrificed for the economic benefits that the mining industry brings. According to Douglas and Wildvasky (1982, p. 81), "science and risk assessment… explicitly try to exclude moral ideas about the good life. Where responsibility starts, they stop".

To conclude the logological analysis, an ostensible objectivity and procedural validation that underpins scientific methods is achieved by silencing contradictory scientific studies about the likelihood of a state of non-rechargeability of the GAB by hierarchy institutions (Douglas, 1986). In the process, moral and ethical dimensions of GAB water extraction by the market institution is ignored (Douglas, 1986; Douglas & Wildavsky, 1982).

7.3 Preferred learning style, View of nature and Property of knowledge ideal of the border institutions

This section outlines the border institutions' learning style, view of nature, and property of knowledge ideal and demonstrates the difference from those of the centre institutions - BHP OD and the Australian Federal and South Australian governments. The evidence of these interests is drawn from public submissions to ODEP EIS (BHP Billiton, 2009), media articles and academic references, as they represent the border institutions' holistic learning style (grammatical analysis) (Ney & Thompson, 2011), view of a fragile nature with depleting resources (rhetorical analysis) (Schwarz & Thompson, 1990), and property of knowledge ideal characterised by imperfection (logological analysis) (Douglas & Wildavsky, 1982). This documentary evidence is often in the form of critical comments to: the assumed rechargeability of the GAB; the evolving nature of scientific knowledge to understand the impact of BHP OD's existing GAB water extraction; and, the proposed increased extraction amount for ODEP on this groundwater resource and related ecosystem (BHP Billiton, 2009, 2011a). This evidence often uses more subjective language. It is not unexpected that some media articles (e.g. Great Artesian Basin Protection Group, 2009c; Serve the people, 2008) cite scientific inquiry that is contradictory to the scientific results of those accepted by the centre institutions (e.g. Endersbee, 2000b), as border institutions prefer to reveal the "polarized and politicized" scientific community itself to make their frustrations over scientific disputes visible (Douglas & Wildavsky, 1982, p. 65).

7.3.1 Grammatical Analysis - Preferred learning style of border institutions

Border institutions construct themselves as agents whose acts are characterised by "timorous forbearance" which necessitate an "effective sanction" for prevention of a possible catastrophe (Thompson et al., 1990, p. 27).

With the belief that the GAB groundwater resource is depleting, it is difficult for the border institutions to accept scientific experimentation and continuous trial and error processes from centre institutions (Thompson et al., 1990) as the proper knowledge type and learning style. From this perspective, any uncertainty or error is considered likely, therefore, to cause irreversible damage (Thompson et al., 1990) and is therefore unacceptable. Lad A (CL 233, n.p.) notes that evolving scientific knowledge is subject to errors and believes that it is about "making a hypothesis and then trying to prove it right or wrong." As a result, "[h]istory is riddled with 'experts' presenting facts that are later proven to be wrong".

Lad A (CL 233, n. p.) also emphasises that, although trial and error processes are widely accepted by industry as "a recognised pathway to achieve a particular outcome", with respect to BHP OD's impact on the GAB water system, "proceeding with projects [e.g. ODEP] based on current understanding rather than fact" is more likely to have "major, usually irreversible" consequences (Lad A, CL 233, n.p.). Other documentary evidence from the border institutions directly questions the assumption of rechargeability suggested by the hierarchy.

The border reveals flawed experiments and limited data (Douglas & Wildavsky, 1982) arising from BHP OD's modelling studies for predicting declined spring rate due to the operation of wellfields. For example, the Great Artesian Basin Protection Group (2009b, 2009c) suggests that the Australian Federal and South Australian governments are unable to comprehend the 'real' non-rechargeability situation of the GAB. The reason lies in a flawed key assumption of a commonly applied mathematical model of groundwater. Endersbee[39] (2000b, n.p.) also points out that

[39] Professor Endersbee's research represents scientific inquiry that is contradictory to the scientific results of those accepted by the centre institutions. Endersbee (e.g. 2000b) assert that the GAB is a closed system with finite plutonic water resources and this finding is often cited in publicly-available documents from the border institutions (e.g. Great Artesian Basin Protection Group, 2009c; Serve the people, 2008).

the concept of rechargeability from rainfall is "wrong and encourages waste, thereby seriously harming the long term yield of this resource of water"[40].

According to Endersbee (2000), the GAB water is a plutonic resource.

> The sediments [of the GAB] are normally consolidated. The water that was in these sediments at the time of deposition has been slowly squeezed out over geological time …Sediments derived from sands consolidate into sandstones. Even though a bed of sand may originally have an open structure, the processes of consolidation reduce the porosity. Waters derived from the consolidation of other sediments may enter the free spaces and precipitate other minerals, and the sand structure deforms under the increasing stresses (Endersbee, 2000b, n.p.).

Therefore, all computer programs or models derived from this flawed assumption of a rechargeable GAB are "potential traps for the unwary" (Endersbee, 2000b, n.p.).

From the border institutions' perspective, the models have "many unknown components" (Taylor R, CL 337, n.p.). Keane (1997, p. 44) suggests that the hydrogeological model used in the ODEP 1982's EIS is "simplistic" and the subsequent results represent "a very slim understanding and appraisal of the impact on the mound springs (See Table 7.2)."[41] The "significant deficiency in the amount of knowledge" and limited availability of hydrogeological data have made the models "at best very rough estimates" (Keane, 1997, p. 50).

Moreover, Mudd[42] (2000) demonstrates numerous factors that are likely to influence the observed rate of a spring flow. And he emphasises that "these factors are hard to account for quantitatively and are typically ignored in compiling variations and long-term changes in spring flow rates" (Mudd, 2000, p. 468). As such, those "unresolved"

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[40] Endersbee (2000b, n.p.) further categorises and elaborates several aspects of the 'false impression' that the Queensland government 'rechargeable' aquifer diagram (see Figure 7.1) conveys. First, he considers the vertical scale of intake beds in the diagram that shows "intake beds as strata lying in an almost vertical direction with the beds exposed to the rainfall". Endersbee (2000b, n.p.) reveals the rhetorical effect of the image (Barthes, 1977; Davison, 2011) and contends that it is misleading as "the beds are virtually horizontal" around these so-called "recharge" regions.
Second, Endersbee (2000b, n.p.) asserts that rocks in those regions are "sound and impervious" which makes it impossible for the surface rainfall to enter and percolate underground for thousands of kilometres.
Third, Endersbee (2000b, n.p.) is concerned about the relative density of the rock (2.6) and the water (1.0). The Queensland government diagram does not consider such differences, instead it implies an impossible physical phenomenon - "the pressure head of the seepage water from the intake beds, less friction losses all the way, would be sufficient to overcome the stresses in the rock at the base of the borehole" (Endersbee, 2000b, n.p.).
Fourth there is a concern about the claimed "water-bearing porous sandstones" at the bottom of sedimentary rocks. Such porous sandstones could only exist under fairly high water pressure, which has to be "comparable to the stresses in the rock". Such water pressure shows "a plutonic source of water from the bedrock below the strata" (Endersbee, 2000b, n.p.).

[41] For example, according to Keane (see also Great Artesian Basin Protection Group, 2009a; 1997, p.471)"By the early 1990s it was apparent that impacts on the mound springs were underestimated in Kinhill (1982)… By 1990 the spring vents at Priscilla and Venables had ceased flowing, and there were visible reductions in flows and wetland area at other spring complexes, notably Hermit Hill, Beatrice and Bopeechee."

[42] Dr. Mudd is a scientist whose scientific views are contradictory to the scientific results of these accepted by the centre institution (Mudd, 2000).

aspects of the models "give rise to uncertainty in the predictions" (Mudd, 2000, p. 470).

From BHP OD's perspective, the modelling studies are prone to errors and are subject to an evolving process (Section 7.2.1). However, for the border institutions, those assessment approaches and improved modelling studies adopted by ODEP 1997 EIS still contain "some gross inadequacies that need to be corrected by collection of data and independent analysis" (Keane, 1997, p. 50). Keane (1997) points out that problems remain in accurately measuring the flows from the springs and the pressures in bores over several years period to determine if the GAB underground water system is in equilibrium[43].

Holistic knowledge characterises the ideal learning style for border institutions (Ney & Thompson, 2011), and it is considered as the key to understanding and protecting a fragile GAB underground water system with depleting water resources. This degree of completeness does not only require the acknowledgment of scientific debate, but also embraces Aboriginal knowledge beyond the field of formal scientific inquiry (Ney & Thompson, 2011). For example, the Great Artesian Basin Protection Group (2009d) contends that our current knowledge of the groundwater system is still poor, especially when considering the "long-time scales associated with shifts in the condition of many groundwater systems" (Great Artesian Basin Protection Group, 2009d, n.p.). Professor Endersbee (2000b, n.p.) points out that while scientific research activities have become increasingly specialised in our society and has led to "an increasing narrower concentration of effort", what is really needed is "free and open" scientific inquiry and more "learned debate".

[43] Keane (1997, p. 49) specifies some significant flaws embedded in the computer model used in ODEP 1997 EIS : "The recent figures are derived from a computer model used by Berry and Armstrong. Several comments on this model will be made:" (Keane, 1997, p. 49)
"The estimates are based on 50% of the South Australian portion of the GAB. The inflow into this reduced portion is approximated at 76 ML/day. This is a very small estimate when compared to 425 ML/day for the water balance of South Australia as a whole." (Keane, 1997, p. 49)
"It underestimates vertical leakage, leading to higher groundwater flow through the aquifer units. This results in an over-estimate of the potential bore flows that actually occur in the field." (Keane, 1997, p. 49)
"The analysis of the Lake Eyre portion of the basin in South Australia puts the ODO water extraction into proper perspective. It shows it as being 18% of the total water movement in the local region. If the ODO usage expands to 42 ML/day as planned, this will represent 55% of the water movement through the region." (Keane, 1997, p. 49)
"The model incorporates an assumption that GAB is in steady state, ie. there are no changes over time. This is based on the classic Habermehl paper of 1980 (Habermehl, 1980), which claimed that the basin is in equilibrium - "provided no new major developments occur which will affect this equilibrium situation, discharge and potentials will not change significantly". In the seventeen years since this statement was made many large scale developments have occurred in South Australia and the basin as a whole. The assumption of equilibrium let alone steady state needs much scrutiny and critique. Equilibrium, unlike steady state, is a balance between opposing processes where the dynamic position is able to change" (Keane, 1997, p. 49).

Apart from scientific inquiry, serve the people (2008, n.p.) argues that Aboriginal knowledge of the GAB water resource is rich because of "the accumulation of many tens of thousands of years of practical experience in surviving and maintaining communities on the driest continent in the world." According to an Aboriginal miner, for example, "water in the centre of Australia…is like a spider's web of streams under the ground, and [Aboriginal people] knew where to dig for it." (Serve the people, 2008, n.p.) This is consistent with Ney and Thompson's (2011, p. 41) argument that Aboriginal knowledge has taught that life in all kinds and forms are connected vitally- "everything is connected to everything else". To conclude the grammatical analysis, border institutions believe that the assumption of rechargeability is flawed and BHP OD's modelling studies are faulty due to simplistic models and limited data. Holistic knowledge that acknowledges both counter scientific inquiry and Aboriginal knowledge is desirable.

7.3.2 Rhetorical analysis - View of nature of border institutions

While constructing holistic knowledge as the appropriate agency of learning style, border institutions promote identification with the public by framing themselves as moral agents who seek to treat the ecosystem with great care (Schwarz & Thompson, 1990), permitting "life in its varied and beautiful forms to continue" (Douglas & Wildavsky, 1982, p. 135). Border institutions therefore construct another hierarchy and social order distinct from market and hierarchy institutions. The myth of an 'Ephemeral' nature is recommended (Thompson et al., 1990); where nature is constructed as fragile with depleting resources (Schwarz & Thompson, 1990).

Contrary to the view from centre institutions, border institutions construct the GAB water system as a scarce and vulnerable water resource in an arid environment. For example, "South Australia is the driest state in the driest inhabited continent" (Amery-Gale M, CL 99, n.p.) "with evapotranspiration generally exceeding rainfall by an order of magnitude or more" (Mudd, 2000, p. 465). From the border institutions' perspective, the GAB groundwater system is an interconnected system and part of an intricate 'web of life' (Douglas & Wildavsky, 1982; Ney & Thompson, 2011). According to Mudd (2000, p. 468), "the mound springs are the only permanent source of water in the arid interior of South Australia and a delicate yet intricate ecological balance has been established". These unique mound springs

"contain many endemic and rare species that have undergone genetic differentiation and speciation." As such, reduced flows from mound springs are very likely to have detrimental effects on those rare species (Henderson K, CL 196; Great Artesian Basin Protection Group, 2009d, n.p.). The border institutions perceive the natural world as closely linked to the human world and they hold a utopian view that life of all forms is in an equal position and exists in a balanced and harmonious ecosystem (Douglas & Wildavsky, 1982). For example, the outflow of groundwater from the GAB plays a "vital" (Mudd, 2000, p. 468) role for Aboriginal people who have inhabited this "desert region" (Keane, 1997, p. 23) for "many thousands of years and remain so to this day" (Mudd, 2000, p. 468). In addition, "it is impossible in modern times to predict, with any confidence, that an individual mound spring does not have any significance due to similarities with other springs in an area." (Mudd, 2000, p. 468).

Springs from the Lake Eyre region "are recognised as being under the traditional custodianship of the Arabanna people" (Mudd, 2000, p. 468). This is supported by the evidence that "abundant stone chips, grinding stones, other traditional tools in the vicinity of the springs, and … the rich mythological and oral history of the springs in Aboriginal culture" (Mudd, 2000, p. 468). Keane (1997, p. 23) gives an example that "the Bubbler [spring] is described by Aboriginal people as the convulsions of the ganmari snake which was killed by a Guyani ancestor". Therefore, all the mound springs have a fundamental importance to traditional inhabitants, and the deterioration of any group of springs could cause significant distress to some Aboriginal people, regardless of their direct or indirect associations with the sites (Hercus and Sutton, 1985, cited in Keane, 1997; Mudd, 2000). Border institutions identify the acts from market and hierarchy (centre) institutions as "guilty" (Livesey, 2002b, p. 127), since they believe human activities have brought along disastrous physical consequences on the natural world (Ney & Thompson, 2011). In this case, human beings have exerted negative impacts on the GAB groundwater system for centuries, which has led to depleting water resources. Mudd (2000) suggests that the GAB spring flows and artesian pressures were relatively high before European settlement. "[E]xcessive development" of the GAB by European activity over the last century has led to "an overall decline" in the spring flows (Mudd, 2000, p. 463).

The volume of BHP OD's proposed increased water extraction from its expansion project is also contested. For example, Keane (1997, p. 34) illustrates that the agreed GAB water extraction limit of 42ml/d for Olympic Dam is a large amount which "accounts for 9-25% of the total artificial extraction from the south western portion of the GAB". Public submissions to ODEP EIS (BHP Billiton, 2009) and media articles also present the view that both existing and proposed GAB water extraction is immense for South Australia as a "tragically dry state" (e.g. People for Nuclear Disarmament (WA), CL 65, n. p.).

To conclude the rhetorical analysis, border institutions view the GAB as a fragile water system with increasingly depleting water resources. Furthermore, it is very likely to be a non-rechargeable, therefore, non-renewable resource. The border institutions' holistic view holds that nature is intricately connected and closely linked to the wellbeing of human and non-human inhabitants (Ney & Thompson, 2011). While maintaining a utopian view that all life forms are equal and exist in a harmonious ecosystem (Douglas & Wildavsky, 1982), the border institutions argue that human activities such as BHP OD's water extraction have had negative impacts on the GAB water system.

7.3.3 Logological analysis - Property of knowledge ideal of border institutions

The paradoxes and controversies inherent in the hierarchising and separating effects derived from the properties of centre institutions' knowledge ideal, provide opportunities for border institutions to resist and transform. Through the construction of holistic knowledge as agency and identification of nature as ephemeral and fragile, border institutions establish 'imperfection' as the terministic screen. With respect to the property of their knowledge ideal, this is in order to legitimate their preferred social order and learning style.

Since border institutions' knowledge ideal is morally explicit, they acknowledge a "polarized and politicized" scientific community to make scientific disputes visible (Douglas & Wildavsky, 1982, p. 65). From the border institutions' perspective, the centre institutions highlight scientific 'facts' while obscuring other information (Douglas, 1986) with regard to the notion of a rechargeable GAB and manageable water abstraction from BHP OD's wellfields. It is suggested that "the firm belief in

the rechargeability" of the GAB (Endersbee, 2000b, n.p.), along with the subsequent "wilful ignorance" of the opposite position (Owen, 2009, p. 2), have contributed to immense wastage of the GAB water resource (Endersbee, 2000b; Great Artesian Basin Protection Group, 2009b).

For example, Endersbee (2000b, n.p.) admits that he feels alone as he "seem[s] to be the only person in Australia who was saying that the Great Artesian Basin was definitely not being recharged from surface rainfall", while his colleagues and friends are "apprehensive". And, it is surprising to see "the intensity of the opposition" which "attempt[ed] to persuade ATSE [Australian Academy of Technological Sciences and Engineering] not to publish … [his] paper," especially at the level of State government. The State government[44] even told the Australian Geological Survey Organisation to "keep out of groundwater studies, as that was a state responsibility." In its broader context, Endersbee (2000b, n.p.) argues that it represents a "warning light" that demonstrates that scientific inquiry is not always "free and open" in Australia; especially where "[t]he struggle for funds" gives rise to "an increasingly narrower concentration of effort." Apart from the wilful ignorance of the debatable nature of the GAB at the State government level, the current water extraction from BHP OD's wellfields and the proposed continuous and even increased GAB water extraction amount, according to Greens Parliamentary Leader Mark Parnell, is "more culpable" (South Australia, Legislative Council 2011, p. 62) for "the extinction of Mound Springs and the harm to a number of others." (South Australia, Legislative Council 2011, p. 6). It is evidenced by Keane (1997, p. 64) that it appears that BHP OD has "ignor[ed] the expert advice" regarding the potential environmental and ecological impact in the first place.

From the perspective of the border institutions, such wilful non-disclosure from centre institutions can be attributed to "economic self-interest"; where research funding and investment "serve to hide the truth" of potential environmental risks and pollutions (Douglas & Wildavsky, 1982, p. 59). For example, the Great Artesian Basin Protection Group (2009b, n.p.) suggests that this purposeful ignorance may derive from "big money at stake":

[44] Endersbee (2000b) does not name the state government which prevented his paper from publication. Yet from the context of the GAB water related debate for BHP OD's mining operation, it can be inferred that such 'wilful ignorance' represents the interest of the South Australian government in this case.

> [G]overnments receive a lot of revenue from mining, and mines are huge users of GAB water. The GAB water entitlement for Olympic Dam mine alone is 42 million litres a day. It is likely that governments would be reluctant to admit they were allowing a finite resource to be squandered in this way. Much better to assure everyone that it is recharging (Great Artesian Basin Protection Group, 2009b, n.p.)

In addition, Keane (1997, p. 62) suggests that BHP OD made "a mockery" of the process of the EIS "in the name of short term cost reduction". Despite BHP OD's (2008a, 2009a, 2010a, 2011a, 2012a, 2013a) claim that its modelling studies and field investigations have undergone peer-review process and assessment by both Australian Federal and South Australian government experts. It is argued that such a peer-review assessment is flawed as "the government is very reliant on data that comes from the company" (Cleary, 2011, n.p.).

While centre institutions generate the basic scientific techniques of organisation, calculation and discrimination; from the perspective of the border institutions this social order inevitably gives rise to "myopia" (Douglas & Wildavsky, 1982, p. 75). In this case, the border institutions' opinion is that the government and BHP OD's reliance on certain scientific information and advice inevitably imposes 'involuntary risk' on a society which is both ironic and unethical (Douglas, 1986; Douglas & Wildavsky, 1982; Rayner, 2012). For example, Endersbee (2000b, n.p.) asserts that the perpetration of the replenishable GAB myth from the government "promote[s] a gross deception of the public". Owen (2009, n.p.) argues that South Australia, "the state at the end of the Great Artesian Basin … will bear the brunt of this apathy, this neglect, this wilful ignorance by those who hold the policy levels." (Owen, 2009, n.p.).

To conclude this logological analysis, border institutions view scientific and expert knowledge as limited and incomplete because of its evolving nature (Douglas & Wildavsky, 1982). The terministic screen of imperfection is demonstrated in border institutions' holistic knowledge ideal. From this perspective, centre institutions - Australian Federal and South Australian governments and BHP OD's wilful ignorance of counter scientific inquiries and expert advice in the pursuit of economic self-interest is unethical (Douglas & Wildavsky, 1982), as it has caused immense

GAB water wastage and endangered the GAB springs and imposed an involuntary risk on a society that will bear the costs of the mistake.

7.4 **Concept of control**

Accounting recognition and measurement relies on the concept of control, not necessarily ownership. This view is represented in accounting standards such as the International Accounting Standard Board's (IASB) (2001) Framework for the Preparation and Presentation of Financial Statements (thereafter the Framework). According to the IASB (2001, IASB Framework para.16), "[t]he financial position of an entity is affected by the economic resources it controls[45]", and the elements such as assets and liabilities are "directly related to the measurement of financial position" (IASB 2001, IASB Framework para.49). These elements should be recognised[46] if:

> (a) it is probable that any future economic benefit associated with the item will flow to or from the entity; and
>
> (b) the item has a cost or value that can be measured[47] with reliability" (IASB 2001, IASB Framework para.83)

However, this control concept and the subsequent recognition and measurement of relevant assets and liabilities in financial reports is contestable when what is traditionally considered a public good becomes a resource for profit. In this case, the debate over the appropriate learning style to understand the nature of the GAB water resource and the property of knowledge ideal based on cultural risk theory (Douglas & Wildavsky, 1982) provides an opportunity to explore this theme.

As a public good, the GAB can be considered as communally owned. Although it is non-exclusive in use, it can be rival in consumption. In rhetorical analysis, while endorsing the centre institutions' construction of a robust and resilient nature within natural limits and boundaries (Ney & Thompson, 2011), the BHP OD and South Australian government assert that the GAB water resource is rechargeable and BHP

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[45] According to the IASB (2001, IASB Framework para.57), "[m]any assets, for example, receivables and property, are associated with legal rights, including the right of ownership. In determining the existence of an asset, the right of ownership is not essential; thus, for example, property held on a lease is an asset if the entity controls the benefits which are expected to flow from the property".

[46] According to the IASB (2001, IASB Framework para.82), "[r]ecognition is the process of incorporating in the balance sheet or income statement an item that meets the definition of an element and satisfies the criteria for recognition".

[47] According to the IASB (2001, IASB Framework para.99), "[m]easurement is the process of determining the monetary amounts at which the elements of the financial statements are to be recognised and carried in the balance sheet and income statement".

OD only extracts a small amount to process minerals. These assumptions legitimate BHP OD's water extraction sanctioned by South Australian government. The disclosure of GAB water in social and environmental reports from BHP and BHP OD and GAB water regulatory statements and policies from the Australian Federal and South Australian government can be considered as " a means of bundling or packaging uncertainty into an acceptable form" to facilitate the distribution of market institution's rights and obligations (Moerman & van der Laan, 2012, p. 107).

According to IASB (2001, IASB Framework para.49), "[a]n asset is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity". This past event includes the water licence granted to BHP OD from South Australian government "as part of a program to encourage economic growth in an area" (IASB 2001, IASB Framework para.58). However, although the GAB water resource is controlled as an asset by BHP OD for mining operations, this asset is not shown in the BHP OD's balance sheet because conventional accounting only "capture[s] and measure[s] business transactions" (Jones, 2010, p. 130). In IASB's (2001, IASB Framework para.89) words,

> [a]n asset is recognised in the balance sheet when it is probable that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably[48].

In this case, BHP OD does not recognise the GAB water intake for its mining operation as an asset because South Australian government grants it the water licence without charge. This 'asset' is unmeasurable therefore unidentifiable in monetary terms. This controlled GAB water resource will only become an asset when BHP OD is sold. By that time, it will be realised and recognised as purchased 'goodwill'.

The BHP OD and the South Australian government also match the centre institutions' worldview that expert knowledge such as modern science as agency makes it possible for humans to control and manage natural resources (Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990) through calculation, quantification and

[48] According to the IASB (2001, IASB Framework para.34), "[m]ost financial information is subject to some risk of being less than a faithful representation of that which it purports to portray. This is not due to bias, but rather to inherent difficulties either in identifying the transactions and other events to be measured or in devising and applying measurement and presentation techniques that can convey messages that correspond with those transactions and events. In certain cases, the measurement of the financial effects of items could be so uncertain that entities generally would not recognise them in the financial statements".

prediction (Gray, 1992; Power, 2007). In the grammatical analysis, the discourses of the centre demonstrate that BHP OD's GAB water extraction does not have excessive negative impacts that affect the stable and resilient GAB water system because the wellfields operation is well controlled within the most updated scientific knowledge and expertise. Following this assumption, BHP OD does not see that its GAB water extraction entails a 'liability' as the potential water extraction related risk is trivial, uncertain and sometimes non-severable from impacts due to other sources other than BHP OD's wellfields. This non-recognition of 'liability' is also consistent with IASB's Framework. According to IASB (2001, IASB Framework para.49):

> A liability is a present obligation of the entity arising from past events, the settlement of which is expected to result in an outflow from the entity of resources embodying economic benefits.

And,

> [a] liability is recognised in the balance sheet when it is probable that an outflow of resources embodying economic benefits will result from the settlement of a present obligation and the amount at which the settlement will take place can be measured reliably (IASB 2001, IASB Framework para.91)

Such non-recognition of GAB water intake as an asset and the consequent water extraction related risks as a liability in financial reports for BHP OD, is supported by South Australian government. Risk, from both market and hierarchy institutions' perspective, is properly managed and controlled within the centre (Douglas & Wildavsky, 1982). Centre institutions' perspectives reflect managerial and administrative accountability. Managerial accountability is based on the dominant neo-classical economic supposition that social and environmental benefits and costs are immaterial, thought to be unquantifiable therefore unmeasurable in the domain of free market (Freedman & Stagliano, 1990). Administrative accountability, on the other hand, is increasingly concerned with economic growth, therefore "passing more power to the market" (Spence et al., 2010, p. 78).

This non-recognition of both asset and liability disseminates and legitimates the centre institutions' construction of an abundant GAB water resource and scientific, trial and error learning style as the most appropriate learning style to understand and control this water resource. This inference seems to be contradictory to the concept

of neutrality described in IASB's Framework para 36, which requires the information in financial statements to be neutral:

> Financial statements are not neutral if, by the selection or presentation of information, they influence the making of a decision or judgement in order to achieve a predetermined result or outcome (IASB 2001, IASB Framework para.36).

According to Maunders and Burritt (1991, p. 12), incomplete or absence of "representation of uncertain positions may be particularly inappropriate where an omitted outcome constitutes ecological 'ruin'". That is, the accounting system in its current form, serves as an ideological tool for a vested interest to overuse non-renewable resources and downplay ecological impacts (see also Hines, 1989; Jones, 2010). In the logological analysis of disclosures from the centre institutions, 'objectivity' and 'procedural validation' are the 'terministic screens' that underpin scientific methods. This is achieved by silencing contradictory scientific studies regarding the likelihood of non-rechargeability and ignoring the moral and ethical dimensions of the GAB water extraction by the BHP OD (Douglas, 1986; Douglas & Wildavsky, 1982).

According to Buhr (2001) and Lehman (1995), managerial accountability from market institutions and administrative accountability from hierarchy institutions constitute the most common forms of accountability in current western liberal societies. They subscribe to 'business-as-usual' and 'middle-of-the-road' cases for sustainable development. These approaches focus on the scientific and technical dimensions of accountability and subsequently neglect the full social and environmental cost of corporate activity (Andrew, 2007; Beder, 1997; Dumay et al., 2010). This critical perspective is consistent with the border institutions' construction of the GAB water system, their preferred learning style, and the corresponding property of knowledge ideal.

Public submissions to the ODEP EIS (BHP Billiton, 2009), several media articles and academic studies support the border institutions' primary concern for a fragile nature with depleting natural resources (Schwarz & Thompson, 1990) and the incompleteness and limitedness of scientific knowledge and expertise as an authority (Douglas & Wildavsky, 1982). From the rhetorical and grammatical analysis, the

GAB water resource is constructed as non-rechargeable and the corresponding scientific knowledge advocated the centre as contradictory and flawed. This imperfect concept is due to incomplete and limited hydrogeological and hydrochemical knowledge and the uncertainty arising from the use of evolving modelling studies characterised by a trial and error learning process.

Therefore, managerial and administrative accountability from centre institutions manifest an ostensible objectivity with both "positive and negative sanctions" that make "the image of events that counts" (Roberts, 1991, p. 363). These forms of accountability entail "unintended and unacknowledged…environmental consequences that spill out from the pursuit of strategic objectives" (Roberts, 1991, p. 367). In this case, the South Australian government's permission for BHP OD's GAB water intake has had detrimental impacts on this fragile GAB water system. Following on from the border institutions' argument, while controlling the GAB water resource, BHP OD also has responsibility for environmental damage, such as declining spring flow.

From an accounting perspective, these assumptions affect the relevance and reliability ideal of disclosures related to GAB water as a 'controlled' economic resource. According to the IASB (2001, IASB Framework para.29), the relevance of information is closely related to its nature and materiality. In the context of the GAB, the non-rechargeable nature and ecosystem damages exerted by BHP OD's wellfields supports the borders recognition of the obligation that BHP OD has towards the risks associated with GAB water extraction. From the border institutions' perspective, BHP OD should, sooner or later, disclose the likelihood of a non-rechargeable GAB in its notes, explanatory material or supplementary schedules[49], and account for its GAB water extraction related risks as a liability, or at least a contingent liability or a provision[50]. This requirement to participate in a form of

[49] According to IASB (2001, IASB Framework para.88), "[a]n item that possesses the essential characteristics of an element but fails to meet the criteria for recognition may nonetheless warrant disclosure in the notes, explanatory material or in supplementary schedules. This is appropriate when knowledge of the item is considered to be relevant to the evaluation of the financial position, financial performance and cash flows of an entity by the users of financial statements."
According to IASB (2001, IASB Framework para.21), "notes and supplementary schedules and other information…may contain additional information that is relevant to the needs of users about the items in the balance sheet and income statement. They may include disclosures about the risks and uncertainties affecting the entity and any resources and obligations not recognised in the balance sheet (such as mineral reserves)."

[50] According to IASB (2001, IASB Framework para.64), "[s]ome liabilities can be measured only by using a substantial degree of estimation. Some entities describe these liabilities as provisions. In some countries, such provisions are not regarded as liabilities because the concept of a liability is defined narrowly so as to include only amounts that can be established without

moral accountability is more encompassing and acknowledges "a non-instrumental relationship" to the other. In other words, a relationship of obligation to our responsibility for the other that cannot be discharged by reference merely to one's economic interest (Shearer, 2002).

The stability of the centre is disrupted by the 'noisy' border institutions. In this case, the market institution is requested to disclose more information to facilitate information about the "socialization of risk" (Moerman & van der Laan, 2012, p. 107) related to the GAB water. This suggested (extra) information increases "the public awareness of risk" (Moerman & van der Laan, 2012, p. 115) and allows the (re)definition and (re)location of risk management to (re)establish a stable centre institution while fulfilling the interests of the border institutions to settle the "moral problems about social inequality" (Douglas & Wildavsky, 1982, p. 177).

After all, if the current GAB water resource allocation is based on the limited understanding of the renewability of the GAB water resource itself and trial and error modelling studies from BHP OD, whose primary goal is profit-making without independent confirmation from South Australian government, there is a danger for us as a collective to face an [un]expected and unwanted economic, environmental and cultural loss which may threaten our basic living standards. Border institutions embrace an ethical concern regarding "the moral status of economic collectivities, including the scope of the moral community and the good that this community seeks" (Shearer, 2002, p. 541).

If GAB water extraction related risks were represented as a (contingent) liability in BHP OD's financial reports it would define and communicate a different construction of the GAB water system as fragile and depleting (rhetorical analysis). The prevailing mainstream scientific model would no longer be the taken-for-granted method to understand and control the GAB water resource (grammatical analysis). The form moral accountability required by the border institutions consequently cultivates openness and dialogue for social and distributive justice rather than scientific and economic reasoning (Messner, 2009). In Schweiker's (1993, p. 224)

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the need to make estimates. The definition of a liability in paragraph 49 follows a broader approach. Thus, when a provision involves a present obligation and satisfies the rest of the definition, it is a liability even if the amount has to be estimated."

words, "[w]hat we account for and our substantive notions of what is good are bound up with these relations to others and ourselves". Moral accountability as such, requires face-to-face communication and acknowledges mutual understanding in the absence of power dynamics, especially seeks to make the voice of the vulnerable to be heard (Messner, 2009; Roberts, 1991).

According to the logological analysis, the centre institutions - Australian Federal and South Australian governments and BHP OD's - wilful ignorance of counter scientific inquiries and expert advice in the pursuit of economic self-interest is unethical (Douglas & Wildavsky, 1982), as it has caused immense water wastage, endangered GAB springs and imposed an involuntary risk on society.

According to Hines (1989, p. 62), accounting practice is a political activity "by selecting and reflecting materialist aspects of society". Cultural risk theory, by suggesting that assumptions such as the preferred learning style, view of nature and property of knowledge ideal are shaped by institutional beliefs and interests, provides us with a critical lens to analyse the politicised nature of accounting concept of control with subsequent accounting measurement and recognition rules. In this theme, the centre institutions - South Australian government and BHP OD's assumptions of preferred learning style, view of nature and the property of their knowledge ideal has conferred institutional legitimacy on the non-recognition and non-presentation of the controlled natural resource as an asset and its consumption related risks as a liability in BHP OD's financial reports. The border institutions, by challenging those taken-for-granted assumptions, provide us with the opportunity to reconsider this accounting concept of control and its indirect consequences in perpetuating environmental crises.

7.5 **Summary**

This chapter analysed the institutional debate of the GAB water risk through contested disclosures among market institutions - BHP and BHP OD, hierarchy institutions - Australian Federal and South Australian governments and border institutions - civil society, using three major concepts from cultural risk theory, with the application of Burkean rhetorical criticism. From this analysis, different institutional perspectives with respect to the preferred learning style, view of the

GAB groundwater system and property of knowledge ideal and their implications for accounting concept of control and related accountability are elucidated. The following chapter analyses different institutional position in the GAB water risk debate using another three major concepts - attitude towards technology, view of risk and resolution of risk from cultural risk theory, and discuss their implications for accounting concept of stewardship and related accountability.

CHAPTER 8 ATTITUDE TOWARDS TECHNOLOGY, VIEW OF RISK AND RESOLUTION OF RISK

8.1 Introduction

The preceding chapter applied three major concepts of preferred learning style, view of nature and property of knowledge ideal to analyse the institutional debate regarding the Great Artesian Basin (GAB) water - related risks and discussed the implications for the accounting concept of control and related accountability. This chapter applies three major concepts from cultural risk theory: attitude towards technology, view of risk and resolution of risk, to understand the concept of stewardship.

According to Burkean grammatical analysis, intrinsic differences are embedded in attitudes towards the technology of institutional life (Douglas & Wildavsky, 1982). These different attitudes toward modern technology subsequently generate a distinctive view of risk for Burkean rhetorical analysis. Finally in Burkean logological analysis, different institutions select a particular set of risks and foreground certain solutions instead of the others.

The purpose of this analysis is to identify different institutional perspectives with regard to attitudes towards water efficiency related technology, a particular view of the GAB water risks and finally the resolution of risk. This analysis has implications for an understanding of the accounting concept of stewardship and provides insights for social and environmental accounting and reporting practices. The three - level analysis of institutional perspectives and critical themes of accounting and related accountability are displayed in Table 8.1.

Table 8.1 Attitude towards Technology, View of Risk, Resolution of Risk and Stewardship

	Market Institutions	Hierarchy Institutions	Border Institutions
Grammatical Analysis (Discursive features)			
Attitude towards Technology	Pro-technology	Technical Fix	Anti-technology
	Adopt BSC information technology for water management and water efficiency technology to tackle risks	Require water efficiency related technology as a technical adjustment to the extant GAB water use	Water efficiency related technology focuses on techno-economic facets neglecting moral and environmental dimensions of the GAB water risks. These are moral defects as environmental value of the GAB water resource is incommensurable with a short-term economic value
	Constructed and objectified GAB water risks rendered by technology are to control the uncertainty of water sustainability. Manifest through a standard measure in the form of a water efficiency indicators under the protection of legislation		
Steward-ship	Water efficiency related technologies are perceived as centre institutions' stewardship mechanism to account for their financial, social and environmental responsibility		Water efficiency related technologies do not satisfy the discharge of environmental responsibility. Centre institutions' consideration of financial responsibility heavily outweigh that of environmental responsibility
Rhetorical Analysis (Discursive functions)			
View of Risk	Opportunity	Controllability	Need to Minimise
	Design monitoring programs and water efficiency programs to challenge GAB water risks and turn them into opportunities	Establish the *Indenture Act* (1982) to govern BHP OD's mining project	Despite the implementation of monitoring programs and water efficiency programs, BHP OD's mining operation has irreversible risks. Radical change like an outright ban on the BHP OD's GAB water extraction is advocated
	Dual objectives of centre institutions for economic growth and the GAB water protection		
Stewardship	The general fulfilment of managerial stewardship is reflected in the South Australian government and BHP OD's dual objectives. Both financial, environmental and social responsibility has been charged through BHP OD's monitoring and water efficiency programs		BHP OD's GAB water monitoring program and water efficiency program do not fulfil its environmental responsibility. Radical change is needed to discharge centre institutions' managerial stewardship
Logological Analysis (Discursive implications)			
Resolution of Risk	Economic Growth	Regulation	Low Growth and Invasiveness
	Assume economic and market measures are the most appropriate for valuing objects or concepts	Protect standardised operating procedures or regulation as the realistically feasible solution to manage potential threat	Economic expansion is not constructed as an environmental solution. The ODEP is general and the water efficiency related technology in particular imply the promise of the satisfaction of endless wants for capitalist interests without satisfying the real human needs
	Imperialist tendency - ODEP as the best operational solution to sustainable development in general, and water efficiency related technologies in particular. Long-term GAB water value and risks are excluded from centre institutions' risk resolution		
Steward-ship	The continuous improvement of the water efficiency indicator legitimates the managerial stewardship of BHP OD for its extant operation and the proposed ODEP, sanctioned by South Australian government. Social and environmental aspects of the GAB water risks are shifted sideways		Social and environmental responsibility covered by centre institutions' managerial stewardship can only be discharged through requirements for ceasing the GAB water intake from the BHP OD
Accountability	Managerial Accountability	Administrative Accountability	Moral Accountability
	Natural resources are treated as economic good and they are objectified for efficiency and profit maximisation	Taking a social value base allegedly, the main concern is with economic development, with the pluralist political assumptions that the state pursues a neutral mediating role in conflict resolution	Requires moral relations to others which necessitates mutual understanding beyond the giving and receiving of accounts through formal categories provided by managerial and administrative accountability. Political participation is important
	Focus on procedural and technical dimensions of accountability and perpetuate the status-quo without critically analysing the social and environmental effects		

In this chapter the market and hierarchy (centre) institutions (Section 8.2) are analysed before the explication of the border institutions (Section 8.3). The concept of stewardship and associated issues of accountability is then discussed with insights for social and environmental accounting and reporting practices (Section 8.4).

8.2 Attitude towards technology, View of risk and Resolution of risk of centre institutions

As documents issued by BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD) and the Federal and State government correspond to a great extent, both perspectives from market and hierarchy institutions are combined to highlight a consistent view from centre institutions. According to cultural risk theory (Douglas & Wildavsky, 1982), centre institutions encompass both market and hierarchy cultures. In terms of attitude towards technology, both market and hierarchy institutions perceive technological advancement as the solution for economic development without unacceptable environmental risks (Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson & Rayner, 1998). In regards to the view of risk, while hierarchy institutions support carefully planned and designed policies to ensure sustainable development for both economic growth and environmental management (Ney & Thompson, 2011; Thompson & Rayner, 1998); market institutions advocate economic development and believe that environmental risks can be transformed into opportunities by challenging and tackling them boldly (Douglas & Wildavsky, 1982; Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson et al., 1990). In respect of the resolution of risk, while market institutions' technologies imply that market and economic measures are the most appropriate for valuing objects (Douglas & Wildavsky, 1982), hierarchy institutions sanction such technologies as "realistically feasible" solutions to their needs for sustainable development (Douglas & Wildavsky, 1982, p. 93). This constructed and objectified notion of risk facilitates technological and operational expansion without consideration of the long-term environmental risks (Douglas & Wildavsky, 1982).

8.2.1 Grammatical analysis - Attitude towards technology of centre institutions

At this level, contested attitudes towards technology in the broader context of sustainable development are constructed by market, hierarchy and border institutions through discursive practices. According to cultural risk theory (Douglas &

Wildavsky, 1982; Ney & Thompson, 2011; Thompson & Rayner, 1998), centre institutions favour technology, which is dependent on specialised knowledge and expertise to establish and operate. Hierarchy institutions construct themselves as agents whose acts are to protect both economic growth and the environment (Douglas & Wildavsky, 1982). Technology, as agency, is favoured by hierarchy institutions (Douglas & Wildavsky, 1982), because they believe that a successful environmental policy can be executed through technical adjustments to extant institutions (Thompson & Rayner, 1998)

In this case, water efficiency related technology is advocated by the South Australian government to control GAB water risks. For example, according to the South Australian Arid Lands Natural Resources Management (SAALNRM) Board (2009a, p. 29), "one key" approach to management is using water judiciously, as it is the government's responsibility to "eliminate waste and to maximise social and economic benefits in a manner that is environmentally sustainable." Incorporation of water efficiency techniques and technologies and utilisation of industry best practices for all water users is an expectation from the hierarchy (SAALNRM Board, 2009a).

In response, BHP OD adopts 'Best Practicable Technology' (BPT) with assistance from "scientists, ecologists, engineers, hydrogeologists, operators and maintainers" to achieve sustainable management of water extraction from the GAB and "Zero Harm to the environment" (Torrisi & Trotta, 2009, p. 204). BPT is defined as "[t]echnology which minimises risks to people and the environment, now and in the future, that can reasonably be implemented taking social and economic factors into account" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2012d, p. 14). This is consistent with Douglas and Wildavsky's (1982) assertion that market institutions construct themselves as agents open to the view that technology is the symbol for social distinction and wealth generation.

Market institutions tackle environmental risks by using technology to increase the scale of economic production (Ney & Thompson, 2011; Schwarz & Thompson, 1990). In this case, for BHP OD, the GAB water risks are treated as "technical challenges" in which the implementation of advanced technology improves GAB

water use efficiency (Torrisi & Trotta, 2009, p. 200). One example is related to the water flow in the hydromet.

The hydromet, according to Torrisi and Trotta (2009), is sensitive to change in liquor chemistry and is closely linked to water quality. A principal variable which influences the amount of uranium recovered is the concentrate of chloride. That is, an elevated chloride concentration level reduces uranium recovery. Any recycled tailings liquor or lower quality water added to the metallurgical plant to substitute GAB water will increase the level of chloride concentration in the hydromet (BHP Billiton Olympic Dam Corporation Pty Ltd., 2011b, 2012f; Torrisi & Trotta, 2009). This procedure "places an upper constraint on water qualities" that can be fed into the plant to substitute GAB water (Torrisi & Trotta, 2009, p. 200).

To overcome this technical barrier, BHP OD has developed a SYSCAD model for the hydromet plant to improve an understanding of the impact of chloride on uranium recovery. This model determines a maximum operating level of chloride concentration that simultaneously optimises GAB water input (Torrisi & Trotta, 2009). According to Torrisi and Trotta (2009, p. 200), "[t]his project is a good example of Olympic Dam using appropriate technology to improve GAB water use efficiency."

In addition to particular water efficiency technologies, Torrisi and Trotta (2009) also describe the Balance Scorecard (BSC) approach as an information technology that BHP OD has adopted for water management. This approach aims to reduce water demand in each step throughout the (internal) ore production process and includes the setting and achievement of water use targets. It emphasises the basic cycle of continuous water efficiency improvement "where targets are set, plans put in place, actions carried out and measurements taken to confirm any deviations from target and opportunity to set improved targets" (more details of the BSC information technology in BHP OD regarding sustainable water management in Appendix B) (Torrisi & Trotta, 2009, p. 198).

From the perspective of cultural risk theory, BSC information technology adopted by BHP OD is a managerial instrument of control in terms of turning the uncertain and contingent nature of water sustainability into a manageable water risk (Catasús,

Ersson, Gröjer & Yang Wallentin, 2007; Power, 2007). More specifically, this information technology translates both the objectives of economic growth and environmental protection into actions such as setting targets, identifying performance drivers, measuring performance, analysing variance and rectifying variance to make the risk object - water demand for ore production predictable, measurable and therefore manageable (Hilgartner, 1992).

The implementation of a BSC approach to water management is consistent with BHP OD's expectation of "decidability" and "actionability" about the future (Power, 2007, p. 26). The unpredicted force of technological progress regarding water efficiency will render the present "fuss" over GAB water risks irrelevant in the near future (Thompson & Rayner, 1998, p. 48). This adoption of BSC information technology is also consistent with the ideal governing form of hierarchy institutions, in which standardised operating procedures help to "objectify, rank and manage" (Ney & Thompson, 2011, p. 63) GAB water related risks.

BSC information technology is utilised by BHP OD to introduce "standard measures" (Douglas & Wildavsky, 1982, p. 96) and facilitate the valuation of GAB water in a "monetarized" economic system (Douglas & Wildavsky, 1982, p. 95). For example, while water consumption data is presented using the Production Information Management System (PIMS) to track actual water usage against targets (Torrisi & Trotta, 2009); the water usage variance for the operation of individual units is measured by volume and efficiency. This approach is similar to "that used in cost management accounting which can separate cost variances due to volume, efficiency and price" (Torrisi & Trotta, 2009, p. 199). Figure 8.1 provides the formula for calculating the total variance of water usage from a target, where

$$\Delta = V_{actual} - V_{target} \quad (1)$$

$$= e_{actual} T_{actual} - e_{target} T_{target} \quad (2)$$

$$= T_{actual}(e_{actual} - e_{target}) + e_{target}(T_{actual} - T_{target}) \quad (3)$$

Figure 8.1 Total Variance of Water Consumption

Source: Torrisi and Trotta (2009, p. 199)

V is the volume of water expressed as kilolitres

e is water consumption efficiency expressed as kilo litres per unit of production driver

T is the production driver, commonly throughput tonnes in a given period (Torrisi & Trotta, 2009, p. 199).

As Torrisi and Trotta (2009) explain, the first term in Equation 3 illustrates the volume of water consumption which varies according to efficiency changes in underlying processes, while the second term demonstrates the volume of water consumption variance related to throughput change in production.

It is important to note here that the BSC approach modifies various water consumption measurements through variance analysis into a water use efficiency indicator (Catasús et al., 2007). And this water efficiency indicator is introduced by BHP OD as a combination of "standard measures" (Douglas & Wildavsky, 1982, p. 96) to legitimate existing ore production and the proposed Olympic Dam Expansion Project (ODEP) with increased GAB water extraction. For example, according to Torrisi and Trotta (2009), analysing the water consumption variance allows water consumption drivers to be managed for setting targets, identifying possible further improvement for water demand and efficiency, and at the same time, enable other projects to deliver increasing production volume. Figure 8.2 is an example of industrial water use efficiency at Olympic Dam from Financial Year 04-Financial Year 09 with water consumption and water efficiency variances.

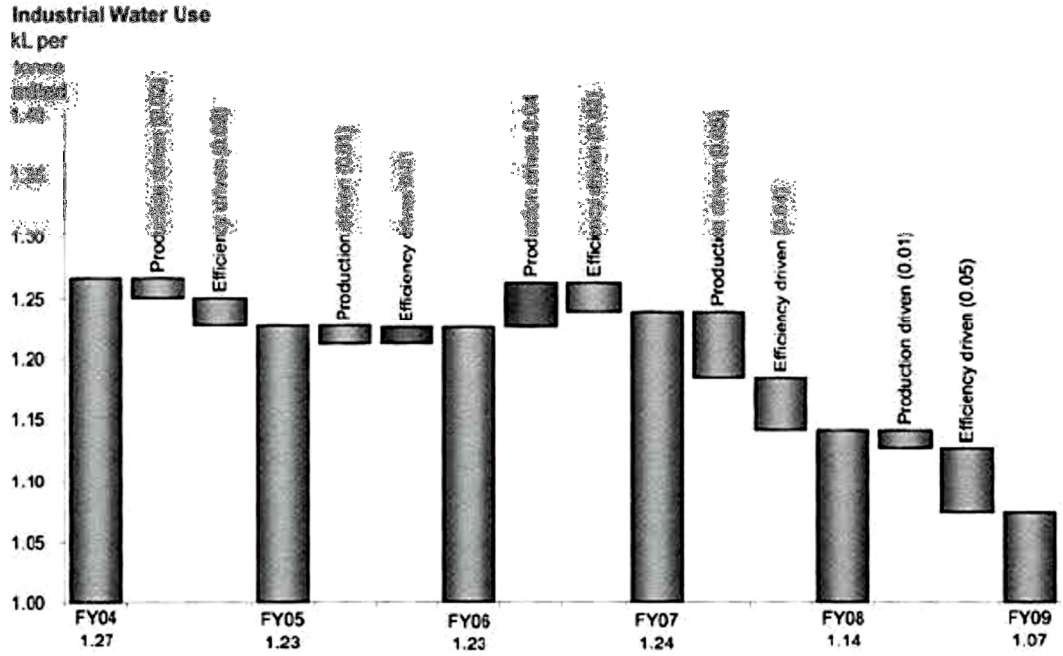

Figure 8.2 Industrial Water Use Efficiency at Olympic Dam, FY04 to FY09

Source: Torrisi and Trotta (2009, p.200)

According to Figure 8.2, from 2000 to 2009, GAB water extraction from BHP OD's wellfields has remained relatively constant despite increased mine production. Since June 2004 to June 2009, there has been an industrial water efficiency improvement of 15 percent from 1.27 KL/ton to 1.07 KL/ton of ore milled (Torrisi & Trotta, 2009, p. 201). It is notable that the diagram or "visual epigraph" has a rhetorical effect (Davison, 2011, p. 129), and is used in BHP OD to promote the image/construction of continuous improvement in water efficiency.

This process of modification of "measurements into indicators", according to Catasús et al (2007, p. 508), reflects an organisation's aim to "distinguish a number that is used as an input in the managerial process from a number that chiefly aims to represent the organisation." In this case, the water efficiency indicator represents the economic achievement and environmental protection of BHP OD as a proxy for how much water is used (and saved) in producing one ton of ore.

According to Torrisi and Trotta (2009), from 1991 to 2009, ore production increased by 490% while the volume of abstracted GAB water increased by 215%. This demonstrates "50% improvement in the GAB water efficiency per unit of milled ore"

for BHP OD (Torrisi & Trotta, 2009, p. 203). By using this indicator, BHP OD demonstrates that more ore could be produced. This is consistent with the market institutions' belief that technological advancement can mitigate environmental risks while boosting production scale (Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson & Rayner, 1998). As such, BHP Billiton claims that "[w]hile future growth may result in an overall increase in water usage, GAB water will be used efficiently so that growth is sustainable" (BHP Billiton, 2007b, p. 225; see also BHP Billiton, 2010).

The advocacy and protection afforded by the standardised measures introduced by BHP OD's BSC information technology and water efficiency technology is explicit in legislation from the hierarchy institution - the South Australian government (Ney & Thompson, 2011). For example, according to the *Roxby Downs (Indenture Ratification) Act 1982* (the Indenture) (p. 31) and Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011 (p. 49), BHP OD

> shall, to the extent that it is reasonably practical and economic for …[it] to do so, design, construct and operate or cause to be designed, constructed and operated all plant so as to ensure the most efficiency use of all water sources.

To conclude the grammatical analysis, while the South Australian government requires water efficiency related technology as a technical adjustment (Thompson & Rayner, 1998) to extant GAB water use, BHP OD has also adopted BSC information technology to tackle the GAB water risks with skill and confidence (Ney & Thompson, 2011; Schwarz & Thompson, 1990). The objectified GAB water risks rendered by technological advancement are used by centre institutions to control the uncertain and contingent nature of water sustainability (Catasús et al., 2007; Douglas & Wildavsky, 1982; Power, 2007). The technological achievement for both productivity boost and reduced water risks (Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson & Rayner, 1998) is manifested through a standard measure in the form of a water efficiency indicator mandated by the South Australian government in legislation.

8.2.2 Rhetorical analysis - View of risk of centre institutions

Drawing upon their image of technology with respect to risk attitude, hierarchy institutions exploit the public interest. By constructing themselves as agents with a

moral imperative to satisfy human needs while protecting the environment with carefully planned and designed policies (Ney & Thompson, 2011; Thompson & Rayner, 1998), they identify as ensuring sustainable development.

In this case, the South Australian government has two main objectives for both economic growth and protection of GAB water. First, hierarchy institutions construct sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 8). Although the market individualists' risk-taking behaviour might be rational to meet human needs and wants, the overall outcome from economic growth is argued to be environmentally detrimental (Ney & Thompson, 2011; Thompson & Rayner, 1998). While this view coincides with the border institutions' normative aspect, it differs in terms of the solution that it promotes (Thompson & Rayner, 1998). Complete risk aversion responses are impractical, and indeed, "social upheaval" would only make things worse (Thompson & Rayner, 1998, p. 305).

For example, the South Australian government acknowledges explicitly that BHP OD's continued GAB water extraction for mining operation is likely to cause declined potentiometric surface of the basin and negatively affect mound spring flows and the associated eco-systems (Government of South Austrlia, 2011b; SAALNRM Board, 2009a). However, the challenge for the government is to preserve advantages of economic growth while leaving sufficient water for the environment and community (Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011; *Roxby Downs (Indenture Ratification) Act* 1982).

BHP OD expresses a similar position with regard to the relationship between economic growth and environmental protection with the South Australian government. Following the Brundtland (1987) definition of sustainability, BHP OD's engineers Torrisi and Trotta (2009, p. 195) define sustainable development in the context of the GAB as;

> [d]evelopment that meets the needs of GAB natural springs hosting flora and fauna, pastoral, mining, petroleum, energy industries and cultural, community, tourism and other users without compromising the ability of future generations and environment to meet their needs.

That is, the sustainability of BHP OD's development relies on using GAB water responsibly while ensuring the mining operation remains viable (BHP Billiton, 2011a, 2012). It is important to note that this is an example of intertextuality. Intertextuality is defined by (de Beaugrande & Dressler, 1981, p. 10) as "the factors which make the utilisation of one text dependent upon knowledge of one or more previously encountered texts". In this case, this definition is drawn on that of the Brundtland report (1987), which seeks communicative and institutional legitimacy (Slembrouck, 2011). This intertextuality is authoritatively informed and has rhetorical effect (Young, 2003). It portrays BHP OD as a responsible corporate agent under the governance of a hierarchy institution. The challenge of scarce natural resources for hierarchy institutions is not to stop economic development with its future expansion, but to find the appropriate rules for stronger governance (Ney & Thompson, 2011).

In this case, the Indenture was established as a legal framework to govern BHP OD's extant and future/proposed mining project (Government of South Austrlia, 2011a). From BHP Billiton's (2009, p. 208) view, this contractual framework allows BHP OD to make significant investment decisions with "confidence" while ensuring "the continuation…of a safe and environmentally acceptable operation capable of providing major economic benefits to South Australia and Australia."

In terms of BHP OD's GAB water intake in general, the Indenture provides a model of management "based on acceptable or allowable impacts on the groundwater resource and dependent ecosystems". That is, it sets a 5 metre default value of drawdown for existing designed areas around Wellfield A and B, which has been adopted to date[51] (Power, 2002). And a particular "lower value of 2.2 metres was set for part of the boundary for Wellfield A in a more sensitive area near the Hermit Hill spring complex" (Power, 2002, n. p.). Two special water licences are granted to BHP

[51] "[T]he designated area shall be that area from which it is reasonably expected that the abstraction of water therefrom by the relevant Joint Venturers or an associated company for the thirty year period next ensuing will not reduce the potentiometric pressure by more than five metres (or such other pressure reduction as may be agreed between the relevant Joint Venturers or an associated company and the Minister of Water Resources) at the boundary of the designated area" (Roxby Downs (Indenture Ratification) Act 1982 p. 28).
"If the Minister of Water Resources has reason to believe that the continued abstraction of water by the Joint Venturers from the designated area will be detrimental to the water resource or that there is a reasonable possibility of a complete or partial failure of the water supply therefrom, he may issue to the relevant Joint Venturers a notice requiring them to restrict the abstraction of water from the designated area to the limit set out in the notice, or, if appropriate, to establish another wellfield and designated area" (Roxby Downs (Indenture Ratification) Act 1982 p. 29).

OD for GAB water extraction under the criteria of acceptable drawdown rate (Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011; *Roxby Downs (Indenture Ratification) Act* 1982).

In particular, BHP OD is required to "design, install and maintain an appropriate monitoring system" to manage GAB water resources, including total extraction volume from production wells, water pressure of all wells and designated areas of the wellfields and water qualities in each well (BHP Billiton Olympic Dam Corporation Pty Ltd., 2012d, p. 8; see also: Power, 2002; Roxby Downs (Indenture Ratification) Act 1982). The Indenture also focuses on a judicious use of water.

BHP OD is required to submit an annual report by a competent hydrogeologist, to define the aquifers' response to water extraction, resources ability to maintain the water supply and strategies for future water exploration, production and management (*Roxby Downs (Indenture Ratification) Act* 1982; BHP Billiton Olympic Dam Corporation Pty Ltd., 2012b, 2012d;). It is worth noting that this report is used as a mechanism for BHP OD to discharge managerial accountability and facilitate administrative accountability for the government (see Section 8.4). As such, the Indenture manifests a desire for mining development and GAB water protection as "incremental…remedial and serial" (Douglas & Wildavsky, 1982, p. 93).

A hierarchy or social order between nature and risk attitudes is subsequently established by market institutions. The GAB water resource is constructed as resilient and able to recover from fluctuations (Ney & Thompson, 2011) such as extraction. A sustainable water management system is implemented to control GAB water risks such as "scarcity… potential environmental impact, operating costs, production constraints, and the influence of a social licence to operate" (Torrisi & Trotta, 2009, p. 203).

According to Gray, Owen and Maunders (1988, p. 13), this 'social licence' is considered "the rule of the game in which the organisation chooses to play". In this case, BHP OD' managerial accountability is based on the requirements of government legislation and therefore conveys corporate legitimacy (see Section 8.4). It is assumed that corporate compliance with legislation is "wholly embedded in the status quo and should, therefore, be acceptable to society-at-large" (Gray et al., 1988,

p. 13). The 'social licence' is also an example of the rhetorical effect of 'intertextuality', as it draws on legislation as authority.

BHP OD submits an annual Environmental Management and Monitoring Report (EMMR) and an annual GAB Wellfields Report to the South Australian Department of Primary Industry and Resources (PIRSA) (BHP Billiton, 2009, 2011a). While EMMR documents general annual environmental achievements and challenges the Environmental Management Program (EMP), the Wellfields Report presents detailed data regarding BHP OD's GAB water supply to assess legal compliance. This includes comparisons between actual impacts of the wellfields' operation against expectations and predictions made in the Environmental Impact Statement (EIS) 1997 (Kinhill, 1997). In addition, evaluation of the GAB aquifers' drawdown response, delineates drawdown effects on environmental flows and pastoral water supplies. A contingency plan is maintained to address unexpected drawdown and spring flow decline around Olympic Dam wellfields (BHP Billiton, 2009, 2011a). As such, the market institution BHP OD constructs "the ingenious, inquiring and experimenting" institution (Thompson et al., 1990, p. 62) or informed agents that challenges and tackles environmental uncertainties "boldly" (Ney & Thompson, 2011, p. 47) through "exhaustive monitoring, analysis, modelling and reviews by [an] independent expert" (Torrisi & Trotta, 2009, p. 203).

It is also worth noting that by adopting water efficiency technology for ODEP, BHP OD constructs the GAB groundwater resource as "a raw material on which human skill, knowledge and daring have been successfully focused" (Thompson et al., 1990, p. 62). In other words, new combinations of expertise and technology are constructed to mitigate the unforeseeable risks and to take care of the future (Thompson et al., 1990).

Therefore, market institutions frame public interest in economic growth and suggest that citizens do not have to "lower standards of living by very much in order to reduce risk a little" (Douglas & Wildavsky, 1982, p. 67). Market institutions attempt to convince the public by constructing risk aversion as the main source of danger, where risk avoiders neglect "the danger averted by new technology, or in advance of experience, the benefits or economic growth" (Douglas & Wildavsky, 1982, pp. 27-

28). In this case, BHP OD has implemented "continuous improvement initiatives" (Torrisi & Trotta, 2009, p. 201), which are said to successfully turn risks into opportunities (Douglas & Wildavsky, 1982; Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson et al., 1990).

To conclude the rhetorical analysis, both BHP OD and the South Australian government have the dual objectives of economic growth and GAB water protection. While the South Australian government established the *Indenture Act* (1982) as a carefully planned legal framework (Ney & Thompson, 2011; Thompson & Rayner, 1998) to govern BHP OD's extant and proposed/future mining project, BHP OD, in response, has designed monitoring programs and water efficiency programs and has implemented improvement initiatives to challenge the water-related risks of its mining operations and turn these risks into opportunities (Douglas & Wildavsky, 1982; Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson et al., 1990).

8.2.3 Logological analysis - Resolution of risk of centre institutions

While constructing technology as an agent and identifying risk as opportunities, market institutions establish 'economic growth' as the terministic screen with respect to their resolution of risk to legitimate their attitude towards technology and view of risk. According to Douglas and Wildavsky (1982, p. 69), a market institution's risk assessment compares risks "by placing their costs and benefits on a common economic plane". In other words, it assumes economic or market measures are the most appropriate for valuing objects regardless of their comparability (Douglas & Wildavsky, 1982). The water efficiency indicator (see 8.2.1) represents an implied risk assessment technique and it is a "technocratic" answer to how much water resource should be sacrificed for how much wealth produced (Douglas & Wildavsky, 1982, p. 150).

However, according to Douglas and Wildavsky (1982), a technical solution preferred by market institutions places too much emphasis on immediate returns or profitability on investments activities. In this case, BHP OD seeks economic growth by taking its GAB water extraction related risks intentionally through its monitoring and water efficiency programme. According to Douglas and Wildavsky (1982, p. 86), "[t]o maintain a rosy expectation of the long term…[market institutions - BHP OD]

must exert continual vigilance in justifying the present system, with its delayed satisfactions."

As Douglas and Wildavsky (1982) further argue, market expectations are short-term and at odds with environmental value which is usually long-term focused (Douglas & Wildavsky, 1982). In this case, BSC information technology and water efficiency technology mask the "moral ingredients" (Douglas & Wildavsky, 1982, p. 70) in decision-making processes.

According to Douglas and Wildavsky (1982), the market institutions' advocacy for technology and absence of consideration for long-term environmental risks is consistent with the preference of the hierarchy institutions. Hierarchy institutions identify risks as something that needs to be controlled and use 'regulation' as the terministic screen with regards to their resolution of risk and legitimation of their risk attitude and preferred social order.

According to Douglas and Wildavsky (1982, p. 93), hierarchy decision-making involves multiple goals which make it relatively easier to "retrospectively rationalize whichever ones happen to be accomplished". "[T]he need that seems most urgent in these conditions is the one whose solution is realistically feasible" (Douglas & Wildavsky, 1982, p. 93). Standardised operating procedures or regulations facilitate this governing style and assist hierarchies to "objectify, rank and manage" a potential threat (Ney & Thompson, 2011, p. 63). In this case, BSC information technology and water efficiency technology are considered as "realistically feasible" solutions to the South Australian governments' "most urgent" need of economic growth without 'unacceptable' environmental effects (Douglas & Wildavsky, 1982, p. 93). They assist the governments in avoiding attempts "to know too much about …[environmental] consequences" by limiting instead of expanding available data (Douglas & Wildavsky, 1982, p. 93).

This point is evident from a Hansard extract of the confrontation between Australian Greens Leader Hon. M. Parnell and Hon. G.E. Gago[52] and his statement that the

[52] The Hon. G.E. GAGO is the Minister for Agriculture, Food and Fisheries, Minister for Forests, Minister for Regional Development, Minister for the Status of Women, Minister for State/Local Government Relations for the South Australian government.

BHP OD's water extraction had "no adverse impact" on the GAB mound springs (South Australia, Legislative Council 2011, p. 5):

> The Hon. M. PARNELL: .... Can the minister first of all confirm that, over the history of this mine, mound springs have been negatively impacted and continue to be negatively impacted? In fact, my understanding is that at least one or two of those mound springs are only maintained artificially by additional pumping of water (South Australia, Legislative Council 2011, p. 6).
>
> The Hon. G.E. GAGO: I think I have already put this on record, that after 25 years of operation there are no impacts on sensitive receptors in the environment that are in excess of those considered and approved in the earlier state and federal [ODEP] environmental impact statements of 1982 and 1987 (South Australia, Legislative Council 2011, p. 6).

Furthermore, according to the Hon. P. Holloway (South Australia, Legislative Council 2011, p. 3675):

> [T]he South Australian government already ensures that [BHP OD's] mining operations conform to world's best practice principles, including…[water] management practices. As such, the government is committed to ensuring that all aspects of an expanded Olympic Dam also conform to these principles.

From the above Hansard extracts, the South Australian government implies that BHP OD's water management system including BSC information technology and water efficiency technology is a satisfactory solution to meet the government's requirements of sustainable development. These overlapping views from BHP OD and the South Australian government reflect the centre institutions' view towards risk resolution. According to Douglas and Wildavsky (1982), both hierarchy and market institutions are fearful of those risks which threaten the system as a whole, as well as public confidence. Both have tendencies towards imperialism, that is, both see expansion of current operational area through technology as the best solution to organisational and institutional problems.

According to Douglas and Wildavsky (1982), market institutions encourage the idea that expansion solves problems such as limited economic growth. The "imperialist tendencies" (Douglas & Wildavsky, 1982, p. 97) from both market and hierarchy institutions mean that BHP OD and South Australian government collaborate (Elliott, 1983; Linsley & Shrives, 2009). According to Douglas (1990, p. 12), a "market individual needs a political base to assure its basic security…[while] hierarchy culture needs an economic base". When interests of both institutions intersect, their

power becomes formidable (Linsley & Shrives, 2009; Moerman & van der Laan, 2012), and risks are considered "properly managed" within the centre (Durkin, 1990, p. 5).

Hierarchy institutions with market institutions consequently create hierarchising and separating effects which (re)produce social divisions and inequities. In this case, BSC information technology regarding water management and water efficiency technology from BHP OD, required and sanctioned by the South Australian government is an ideological tool used by the centre institutions to foresee "disturbance and setbacks in normal course" and "weather" them (Douglas & Wildavsky, 1982, p. 122). As a result, BHP OD and the South Australian government do not embrace "the structure and goals of the environmental movement" regarding GAB water risk (Douglas & Wildavsky, 1982, p. 188).

To conclude the logological analysis, while market institutions assume economic and market measures are the most appropriate for valuing objects or concepts (Douglas & Wildavsky, 1982), hierarchy institutions protect standardised operating procedures or regulation as the "realistically feasible" solution to manage the potential threat (Douglas & Wildavsky, 1982, p. 93). Centre institutions therefore have an imperialist tendency that both BHP OD and the South Australian government perceive ODEP (BHP Billiton, 2009) as the best operational solution to sustainable development in general, and water efficiency related technologies to generate more economic and environmental benefits in particular (Douglas & Wildavsky, 1982; Thompson & Rayner, 1998). The long-term GAB water value and risks, on the other hand, are not incorporated into the centre institutions' risk resolution (Douglas & Wildavsky, 1982).

8.3 Attitude towards technology, View of risk, and Risk resolution of border institutions

This section outlines the border institutions' attitudes towards technology, view of risk and risk resolution and demonstrates the difference from those of the centre institutions - BHP OD and the South Australian government. The evidence of border institutions' interests is drawn from public submissions to ODEP EIS (BHP Billiton, 2009), media articles and academic references. Border institutions construct modern technology as "moral defects" (Douglas & Wildavsky, 1982, p. 7) "enter[ing] and

spoil[ing]" the centre institutions (Douglas & Wildavsky, 1982, p. 124). The view of risk is perceived as impending and irreversible and imposed by excessive economic growth (Douglas & Wildavsky, 1982). Risk resolution is characterised by 'low growth' (Schwarz & Thompson, 1990). This documentary evidence is often in the form of comments critical of the sustainable mining development of BHP OD and its water efficiency related technology and often uses subjective rather than scientific or pseudo-scientific objective language.

8.3.1 Grammatical analysis - Attitudes towards technology of border institutions

Border institutions protest against the technology supported by market and hierarchy institutions because they perceive it as the main source of risk from environmental pollution (Douglas & Wildavsky, 1982). In this case, although BHP OD has applied BSC information and water efficiency technology to GAB water management, from the perspective of border institutions, they are to some degree "deceptive" (Save the basin, 2011c). For example, according to Quilty R and Vervoort W (CL 297, p. 3), there is a "double standard" regarding BHP OD's environmental commitments. On one hand, BHP OD intends to improve its water use efficiency to achieve a reduction by 18% for the ODEP with respect to the amount of water consumption per tonne of ore processed (BHP Billiton (Chapter 25), 2009). On the other hand, it plans to increase GAB water extraction by approximately 9 ML/d, which is equal to 14% of the maximal amount permitted under the current licence (BHP Billiton, 2009).

Additionally, BHP OD's commitment to environmental principles is questionable considering the proposal to build a desalination plant to replace the mine's water demand entirely. According to BHP Billiton (2009), the water demand for the proposed ODEP will be 322 ML/d for the next 40 years plus. As Quilty R and Vervoort W (CL 297) assert, since such an amount is more than 20% of the total output for all water users in the GAB, it is not surprising that BHP Billiton (2009) does not want BHP OD identified as the single largest water extractor from the GAB:

> We are confident that the company would have made these kind of assessments when choosing the political reality of a desalination plant over a much more simple, but massive, expansion of its demand on the GAB limited resource and the likelihood that an extended licence for such a level of GAB extraction would not be granted (Quilty R & Vervoort W, CL 297, pp. 2-3).

A desalination plant is proposed which is capable of producing 40% above the required amount for ODEP. For border institutions, this plant with large excess production capacity, "clearly establishes a belief in the company that the environmental and financial costs of a very large plant are manageable" (Quilty R & Vervoort W, CL 297, p. 3). From the perspective of Quilty R and Vervoort W (CL 297) and the Australian Conservation Foundation (CL 10), the replacement of GAB water with desalination water will have substantial environmental, social and national economic benefits, which is in accordance with the long run interests of border institutions.

However, the ODEP EIS (BHP Billiton, 2009), indicates that not a "single drop" from the proposed desalination plant will offset BHP OD's GAB water demand (Save the basin, 2011c, n.p.). The failure of the EIS to address any potential conservation opportunity of the GAB challenges BHP OD's environmental commitment and its 'high standard' environmental policies and practices (Quilty R & Vervoort W, CL 297).

From the border institutions' perspective, both water efficiency related technology and the desalination related technology emphasises a techno-economic solution to sustainable development. This solution will confront difficulties when faced with the "social judgement" (Douglas & Wildavsky, 1982, p. 70) arising from the GAB water risks.

Indeed, border institutions believe that 'appropriate technology' is the motto of market institutions that "are happy to operate at any size, to any technical specification, within their capacities, providing it is cheap enough to make them a profit" (Schwarz & Thompson, 1990, p. 11). BHP OD's reliance on BSC information technology and water efficiency technology is consistent with this border institutions' perspective of the cheapest alternative. For example, Quilty R and Vervoort W (CL 297) assert that one of the most apparent rationales for the implementation of water saving (technologies) rather than a desalination plant is because the GAB is considered a cheaper water source. This commercial consideration obviously outweighs the environment (Quilty R & Vervoort W, CL 297).

The direct ignorance of biological and cultural value of the GAB mound springs together with the environmental health of the GAB for economic gain in the short term, is "irresponsible" (Henderson K, CL 196, n.p.), especially since long-term environmental value and short-term economic value are fundamentally incommensurable.

> In all of the environmental changes through which Australia will pass during the long life of this proposed mine, conservation of the GAB national resource requires considerably more than today's measure of the value of the processed resources against the cost of GAB water used for that processing. Putting a dollar value on the end product of any process which makes demand on the GAB demeans the word 'conservation'; such a raw economic yardstick is most certainly not the measure by which to ensure that the GAB will meet the challenges of the future (Quilty R & Vervoort W, CL 297, p. 5).

Thus, BHP OD's BSC information technology and water efficiency technology has no place in the border institutions' argument. Border institutions object to 'commensurability' and the "immoral" exercise of the market institution's belief that resources can be "bought and sold" (Douglas & Wildavsky, 1982, p. 67). According to Mackenzie (2009, p. 451), border institutions hold "a bleak, essentialised view of capitalism, as inherently irresponsible and environmentally damaging". Border institutions reinforce that the value of the GAB water resource cannot be measured merely by the eco-efficiency indicator for ore production (profit), as "narrowly conceived" by economics (MacKenzie, 2009, p. 453) (see Section 8.2.1).

According to cultural risk theory, while hierarchy institutions' support a "technical fix" it adopts the market institutions' advocacy for technological advancement (Schwarz & Thompson, 1990, p. 93). Border institutions construct hidden dangers emanating from technology as an evil which will "enter[s] and spoil[s]" the centre institutions (Douglas & Wildavsky, 1982, p. 124). Technological pollution is representative of "moral defects" (Douglas & Wildavsky, 1982, p. 7). For example, in the words of Parnell (Australian Greens, 2007, n.p.) and Takver (2011, n.p.), BHP OD has promised "weak commitments" that have been sanctioned by the South Australian government for years. These commitments, manifested through technology, "seem to be business as usual and are expanded to up to the maximum that BHP can get away with" (Australian Science Media Centre, 2011, n.p. see also Johnson H, CL 217). It is important to note here that border institutions' perceive the

'social licence' (see Section 8.2.2) as a normative model with an explicit value system. It is "clearly at variance with the terms of what is normally accepted to be the status quo" (Gray et al., 1988, p. 12) by the centre institutions. Consistent with Gray et al.'s (1988, p. 13) argument, the 'social licence' from the centre institution accepts legislation as "a full specification of the rules of the game" without acknowledgment of "the role played by the State and/or the current and historical distribution of power in the society". Therefore, border institutions are against "big technology" (Douglas & Wildavsky, 1982, p. 49). In this case, the majority of submissions suggest that the GAB water should not be wasted on unnecessary mining projects such as ODEP (e.g. Anti-Nuclear Alliance of W.A. (ANAWA), CL 7; Derrick A, CL 147; Henderson K, CL 196). And BHP OD should be required to cease its extraction from the GAB as soon as the desalination plant is established (e.g. Australian Greens, CL 13; Conservation Council of South Australia, CL 24; Environment Tasmania Inc., CL 37; Friends of the Earth, CL 42).

To conclude the grammatical analysis, border institutions perceive centre institutions' water efficiency related technology as focusing only on the techno-economic facets of sustainable mining development, while neglecting moral and environmental dimensions of GAB water risks. The failure of BHP OD to address any potential water saving opportunity of the GAB water resource, from its proposed desalination plant (BHP Billiton, 2009), reflects the centre institutions' focus on commercial considerations. From the border institutions' perspective, water efficiency related technologies are "immoral" exercises (Douglas & Wildavsky, 1982, p. 67) that represent the "moral defects" (Douglas & Wildavsky, 1982, p. 7) of the centre institutions. The environmental value of the GAB is fundamentally incommensurable with the short-term economic value manifested through BHP OD's water-efficiency technology for its ore production and ODEP.

8.3.2 Rhetorical analysis - View of risk of border institutions

Border institutions construct a hierarchy or social order different from those from the centre institutions. Nature is constructed as dreadfully unforgiving (Schwarz & Thompson, 1990). According to Douglas and Wildavsky (1982, p. 67), "unbridled economic growth" has exerted harm on the natural environment and humankind. From the border institutions' perspective, although BHP OD's has implemented

monitoring programs and a water efficiency program, the mining operation has had adverse impacts on the long-term sustainability of the GAB water resource as the company incrementally expands its operations (Keane, 1997). Border institutions, unlike the market institutions, do not perceive risk as an opportunity (Schwarz & Thompson, 1990). In particular, BHP OD's mining operations have risked "precious" mound springs (Environment Tasmania Inc., CL 37, n.p.). Anecdotal evidence has been obtained by Keane (1997, p. 21) from interviews with local residents which shows that "the drilling of wells has definitely reduced the spring discharges in the South Australia portion of the GAB." And a few of those springs are "only maintained artificially by additional pumping of water" (South Australia, Legislative Council 2011a, p. 6).

For border institutions, these impending dangers are irreversible. Irreversible risks are "explosive and unstable [with] each deviation growing larger until the environment is so altered it can never return to its original state" (Douglas & Wildavsky, 1982, p. 21). In this case, public submissions contend that the quantities of water extracted by BHP OD for mining operations is "far too large" in this driest continent, especially taking into consideration climate change (Luesby Al, Luesby J, Luesby An, Luesby, CL 244, n.p.; see also Roberts Georgia, CL 304, n.p).

Madigan M (CL 247, n.p.) uses the example of water restrictions in some Australian states to highlight the excessive water intake currently proposed by BHP OD:

> No matter how much domestic households at the Government's request and legislation, attempt to cut back on water use there is nothing that can save the scarce water resources of the state while an incredible 100,000 litres of water every minute is being used by BHP Billiton.

Border institutions therefore align with the public by establishing themselves as moral agents who are unwilling to face irreversible catastrophic degradation with no chance of turning back (Douglas & Wildavsky, 1982). As Douglas and Wildavsky (1982, p. 23) assert, there will be no future if economic development "permits any fool or rogue to inflict irreversible damage".

Border institutions are concerned with all possible damage and assess the long-run as fairly close. Consequently, the future will be different as the continuity of the status quo forebodes an "imminent disaster" (Douglas & Wildavsky, 1982, p. 122). For

example, centre institutions acknowledge the need for stringent licensing and strict monitoring and reporting because of the potential risks associated with GAB water extraction (Save the basin, 2011b, 2011c). However, public submissions in respect of the proposed ODEP, urge the Federal and State government to look back at the "past disastrous government policies concerning the inland river systems, lakes and wetlands" (Great Artesian Basin Protection Group, 2009c, n.p.), and to give serious consideration to the ODEP, as the environmental damages will extend beyond the life of the mine (Bentley A , CL 114).

From the border institutions' perspective, there needs to be a radical change to a 'business-as-usual' (Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990) approach through an immediate adoption of the precautionary principle, in its strict version, for the management of the GAB. The precautionary principle states that "unless policy actors can prove that a particular activity is innocuous to the environment, they should refrain from it" (Ney & Thompson, 2011, p. 42). In the GAB, it is expressed as "where we see a serious threat to the environment, a lack of scientific certainty shouldn't prevent us taking precautions" (Penfold L, CL 288, n.p.). Regarding mining operations in general, this principle promotes the "transitioning to green industry and jobs" (Georgia R, CL 304, n.p.). For BHP OD in particular, this principle implies that the Federal and State governments should acknowledge that it is very likely that the GAB is a plutonic and non-rechargeable resource[53] (see Chapter 7, Section 7.3.2), and alter their water management policies accordingly so as to "conserve and utilise the remaining water in the Basin" (Great Artesian Basin Protection Group, 2009c, n.p.).

Therefore, border institutions urge policy makers "not to delay action until further scientific evidence is available" (Thompson & Rayner, 1998, p. 294), because trial can only be tolerated when there is the certainty of no error (Schwarz & Thompson, 1990). According to the border institutions, asking BHP OD and the South Australian government to extract less GAB water for current mining operations and the ODEP is not enough. What is needed is to preserve GAB springs as well as this groundwater resource itself. For example, it is suggested that BHP OD should

[53] Even it is really replenishable from rainfall, the recharging rate is so slow which is almost negligible comparing with the rate of outflow.

undertake "[a]n environmentally conscientious operation" (Conservation Council of South Australia, CL 24, p. 15). That might include an independent and thorough assessment of the GAB groundwater resource sustainability with a special focus on an extensive historical review of BHP OD's wellfields' impacts on mound springs and investigations to address remedial options for affected springs (Keane, 1997, see also Walsh T, CL 353; Mudd, 2000).

According to cultural risk theory, border institutions aim to "bring man back into balance with the environment" (Douglas & Wildavsky, 1982, p. 137) without "exploitative values, destructive technologies, and de-humanised relationships" (Douglas & Wildavsky, 1982, p. 135). For example, according to Johnson H (CL 217), "[a] genuinely viable economy is based on ecological integrity, not the other way around".

Therefore, restoring the GAB ecosystem and freeing this groundwater resource, "has the added advantage of bringing us much nearer to the desired future-harmony with nature" (Schwarz & Thompson, 1990, p. 10). Border institutions call for an outright ban on BHP OD's GAB water extraction. It is recommended that "[e]very effort must be undertaken to minimise potential and real losses of water" from the BHP OD site (National Farmers' Federation, CL 55). It could be investigations for an alternative source of water supply, eradication of the waste and eventually decommission of the use of the GAB water (National Farmers' Federation, CL 55; Conservation Council of South Australia, CL 24; Environment Tasmania Inc., CL 37). This conservation ideal of the border institutions needs to "become part of a process of 'social learning'…in which institutions to mitigate…[GAB water risks] are created, evaluated and reshaped" (MacKenzie, 2009, pp. 453-454).

To conclude the rhetorical analysis, border institutions perceive that BHP OD's mining operation has created an irreversible risk to the long-term sustainability of the GAB water resource and related ecosystem, despite the implementation of monitoring programs and water efficiency programs. Although it is undeniable that mining development has brought economic benefits, these benefits need to be considered against environmental risks. Border institutions therefore call for a radical change through the adoption of the precautionary principle regarding the

centre institutions' GAB water management policy. An outright ban on the BHP OD's GAB water extraction by the South Australian government is advocated by border institutions as the only solution for risk mitigation.

8.3.3 Logological analysis - Resolution of risk of border institutions

The paradoxes and controversies inherent in the hierarchising and separating effects derived from market and hierarchy (centre) institutions' risk resolutions provide opportunities for border institutions to resist and transform. Through a construction of anti-technology as an act and identification of risk minimisation, border institutions establish 'low growth' as the terministic screen to legitimate their preferred social order and risk attitude.

When border institutions assess risk, they reveal their moral commitments "explicitly and prominently" (Douglas & Wildavsky, 1982, p. 73) and attempt to bring these risks to public attention forcibly (Thompson et al., 1990). For example, Quilty R and Vervoort W (CL 297) analyse BHP OD's intention for continuous GAB water extraction alongside the implementation of the proposed desalination plant. They infer that the 18% water saving proposed in the EIS will reduce BHP's operating costs rather than saving the limited GAB water resource. This is not only an environmental issue, it is also an ethical issue (Save the basin, 2011a, Quilty R & Vervoort W, CL 297):

> If a mining company has a commercially viable alternate source of water available to meet the needs of its operations then should it be allowed to access GAB water for those operations [?] (Quilty R & Vervoort W, CL 297, p. 5)

Underlying this perspective is the assumption of a zero-sum game. This outlook assumes one cannot benefit except at the expense of another. Following the reasoning of trade-off, the border does not tend to take the economic measures from the market (and hierarchy) institutions seriously. Therefore, border institutions do not believe in economic expansion as an environmental solution (Douglas & Wildavsky, 1982).

In this case, several public submissions suggest that although it is undeniable that the BHP OD has brought economic benefits, such benefits need to be considered against environmental risks. As Lad A (CL 233, p.1) contends, for example, while jobs and

economic stimulus arising from the mining industry "aids the state coffers", the question needs to be asked is "should this take precedence over ecological integrity"? As such, any further GAB water extraction for proposed expansion is "unsustainable and indefensible" (Wells J, CL 363, n.p.).

This argument from border institutions shifts the attention to human needs and wants. For border institutions, real human needs are closely bound with the cycle of the eco-system, and are defined in both material and spiritual terms. While material needs cover food, shelter and clothing, the spiritual aspects embrace personal development, self-realisation and harmony with nature (Thompson & Rayner, 1998). In this case, water efficiency technology for ore production implies the promise of satisfaction of endless wants in an age of consumerism which fails to satisfy human needs (Thompson & Rayner, 1998). For example, according to Johnson H (CL 217) and Madigan M (CL 247), our fundamental needs for health, wellbeing and democratic rights are based on pure water, clean air, uncontaminated soil and diversity of species, which should not be "compromised for the monetary gain of big business" (Higginbottom K, CL 199, n.p.).

According to Thompson and Rayner (1998, p. 296),

> Wants…are mere chimeras shaped by commercial interests and packaged by advertising agencies. These chimerical wants then function to ensure continued economic growth by creating demand for unnecessary and wasteful products.

In this case, border institutions identify BHP OD and South Australian governments' capitalist imperative for endless ore production as a major reason for the over extraction of GAB water. To maintain the desired profit margin, vested interests pursue unsound environmental practices with no regard to the cost on the natural world (Thompson & Rayner, 1998). For example, Mudd (2000, p. 473) asserts that it seems that BHP OD and South Australian State government have outlined the most fundamental principles for GAB groundwater management with "very little" emphasis on the GAB resource management to "sustain minimum environmental flows" of the GAB springs.

For border institutions, excessive development of mineral resources in general and water efficiency related technologies in particular, count as unnecessary and wasteful operations. A subsequent rise in profit and income from increased ore production

does not signify an improved quality of life. Instead, BHP OD's entitlement to the immense extraction of GAB water represents an unfulfilled human need. The living environment has been damaged by those environmentally irresponsible and unsustainable activities (Ney & Thompson, 2011; Thompson & Rayner, 1998). For example, as Derrick A (CL 147, n. p.) asserts, "we do not need mining and development at any cost". According to Luesby AL, Luesby J, Luesby An, Luesby N (CL 244, n.p.), "water is more precious to us than uranium income or jobs." If the BHP OD's mining water usage from the GAB exceeds the renewal rates (if there is any), "we are literally robbing from our children their right to access …water" (Ella, CL 258, n.p.). As such, BHP OD's BSC information technology for water management and specific water efficiency technology from the border institutions' perspective manifests an "undemocratic unresponsiveness to individual needs" (Douglas & Wildavsky, 1982, p. 149), and demonstrates an "unfeelingness for individual suffering" within society (Douglas & Wildavsky, 1982, p. 127).

To conclude the logological analysis, border institutions do not construct economic expansion as an environmental solution (Douglas & Wildavsky, 1982). The ODEP in general and the water efficiency related technology in particular implies the promise to satisfy endless wants for the capitalist interests of centre institutions without satisfying real human needs (Thompson & Rayner, 1998). Border institutions therefore are against GAB water extraction for "unnecessary" mining projects like ODEP even with water efficiency related technology (Schwarz & Thompson, 1990, p. 9) .

8.4 **Stewardship**

There are two basic views of the objectives of financial reporting adopted by accounting standard setters. One is decision-usefulness and the other is stewardship (International Accounting Standard Broad (IASB) 2001, IASB Framework para. 12; 13; 14). Stewardship is derived from property rights and is based on the idea that managers as agents look after the assets or resources which are entrusted to them by the owners (IASB 2001, IASB Framework para.14). The concept of stewardship has evolved through historical development from traditional custodial relationship to the modern concept of managerial performance (O'Connell, 2007; Pannell, 1979). According to Chen (1975), the managerial stewardship concept covers not only the

responsibility to immediate owners-shareholders' interest, but also social responsibility. In other words, it requires managerial accountability to not only embrace the "resolution of agency problems between management and owners" (Shearer, 2002, p. 562), but also extend to the stewardship of environmental assets. The competing views of stewardship hinges on an understanding or disclosure of that which a company is said to control. Companies should become accountable for the natural resources which they control and their business activities' environmental impacts (Jones, 2010). As such, the needs for social and environmental reporting can be considered as originating from the broader notion of managerial stewardship (O'Connell, 2007).

However, as some critical accounting researchers (e.g. Adams et al., 1998; Broadbent, 1998; Gray, 2006; Roberts & Scapens, 1985) contend, the current social and environmental reporting practices reinforce 'business-as-usual' and 'middle of the road' approaches, and do not provide sufficient and comprehensive information to meet the needs for achieving environmental and social sustainability. This argument is evident when managerial stewardship of a natural resource or public good, e.g. the GAB, is contested. Cultural risk theory, by contrasting the distinctive assumptions of attitude towards technology, view of risk and risk resolution from market, hierarchy and border institutions, provide us with the rationale to understand this debate from both mainstream and critical accounting perspectives.

In rhetorical analysis, according to Ney and Thompson (2011) and Thompson and Rayners (1998), centre institutions support a well-planned and designed policy to integrate economic growth with environmental management, and they assert that environmental risks can be reduced and mitigated through the transformation of risks into opportunities in the advancement of economic development (Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson et al., 1990). In this case, the general fulfilment of managerial stewardship from the perspective of centre institutions is reflected in the South Australian government and BHP OD's dual objectives for both mining development and the GAB water conservation.

While the South Australian government represents societies' interests to grant BHP OD the GAB water licence for its mining operation, it has established *the Indenture*

Act (1982) as a carefully planned legal framework (Ney & Thompson, 2011; Thompson & Rayner, 1998) to govern mining development. BHP OD management has become, not only a steward for tis shareholders, but also the steward of the GAB water system for civil society as a whole. From the perspective of centre institutions, both financial, environmental and social responsibility has been discharged through BHP OD's monitoring and water efficiency programs since these programs control the GAB water extraction related risks to an acceptable level according to legislation.

This perspective reinforces the managerial accountability of market institutions and administrative accountability of hierarchy institutions. Under managerial accountability, natural resources are treated as an economic good and they are objectified for efficiency and profit maximisation (Shearer, 2002). Administrative accountability, albeit taking a social value base, has been mainly concerned with economic development (Spence et al., 2010). It is also founded on the pluralist political assumptions that there is no profound social conflict and "the state pursues a neutral mediating role in conflict resolution" through regulation (Tinker et al., 1991, p. 29).

It is important to note that in the grammatical analysis, sustainable development from centre institutions is constructed as a technical issue which can be solved by the power of modern technology (Ney & Thompson, 2011; Schwarz & Thompson, 1990; Thompson & Rayner, 1998). In this case, while the South Australian government believes that a successful environmental policy can be carried out through technical adjustments manifested through water efficiency technology; BHP OD considers water efficiency technologies as able to tackle the GAB water risks with skill and confidence while increasing the scale of ore production. Therefore, BHP OD has adopted BSC information technology and the specific water efficiency technology to construct and objectify GAB water risks to facilitate management in accordance with the legislation. These water efficiency related technologies are used by the centre institutions' as a stewardship discharging mechanism to account for their financial, social and environmental responsibility. In particular, BHP OD has introduced various water demand and consumption measures and modified them into a water efficiency indicator.

In the logological analysis, continuous improvement of the water efficiency indicator legitimates managerial stewardship of BHP OD for its extant mining operation and the proposed ODEP. It constitutes a "realistically feasible" solution to sustainable mining development from the South Australian government's perspective (Douglas & Wildavsky, 1982, p. 93).

However, according to Douglas and Wildavsky (1982), the centre institutions tend to ignore long-term environmental risks. While market institutions assume economic and market measures are the most appropriate for valuing objects or concepts (Douglas & Wildavsky, 1982), the hierarchy institutions prefer to segregate and define 'sustainable development' by upgrading certain dimensions of risks while downgrading others (Ney & Thompson, 2011). In this case, BHP OD's water efficiency related technology and the water efficiency indicator advocated and supported by the South Australian government reflect the market institution's belief in economic measures as appropriate for GAB water and the hierarchy institutions' preference of highlighting economic and technical aspects of the GAB water risks while shifting social and environmental aspects sideways.

As Andrew (2007) asserts, managerial and administrative approaches to accountability largely focus on procedural and technical dimensions of accountability. They form a "strict liberal accountability" framework perpetuating the status-quo by simply providing information to allow efficient utilisation of scarce resources without critically analysing what the market institutions are doing to the environment and society (Lehman, 1999, p. 518). The ignorance of long-term GAB water risks from centre institutions has triggered a contest over BHP OD's managerial stewardship from the border institutions' perspective.

According to the rhetorical analysis of cultural risk (Douglas & Wildavsky, 1982; Schwarz & Thompson, 1990), border institutions do not see risks as opportunities. On the contrary, they hold that unbridled economic growth has exerted irreversible risks on the environment. In this case, border institutions believe that BHP OD's mining operation has had significant adverse impacts on the long-term sustainability of the GAB water resource as the company continuously expands its operation. Such impacts have outweighed the economic benefits brought by the mining operation. As

such, BHP OD's GAB water monitoring program and water efficiency program which seem to objectively control GAB water risks to an 'acceptable' level does not fulfil its managerial stewardship regarding environmental responsibility from the border institutions' perspective.

This is consistent with Christie, Dyck, Morrill & Stewart's (2013, p. 389) argument of accounting as a "part of the rationalizing form of [measurement and] calculation necessary to organise and give meaning to economic action". In Adam's (2004, p. 732) words, the alignment of managerial accountability and administrative accountability brings into focus "sustainability of the business [and government] rather than [social and] environmental sustainability." For that reason, border institutions advocate a radical change to 'business as usual' and 'middle of the road' approaches through an immediate adoption of the precautionary principle regarding the GAB water management policy to discharge centre institutions' managerial stewardship towards the GAB groundwater resource and its related ecosystem.

In the grammatical analysis, border institutions construct modern technologies as the main source of environmental risks (Douglas & Wildavsky, 1982). In this case, border institutions perceive BHP OD's BSC information technology and water efficiency technologies, encouraged and sanctioned by the South Australian government, as focusing merely on techno-economic facets of sustainable mining development. This is consistent with Gray's (1992) assertion that managerial and administrative accountability internalises through numerical quantification, environmental management and reinforces an analytical, scientific and technical solution (see also Beder, 1997; Dumay et al., 2010). In particular, the failure of BHP OD to address any potential water saving opportunity of the GAB water resource associated with its proposed desalination plant and its plan for further increased GAB waster extraction for the ODEP, reflects the underestimation of full social and environmental costs (Beder, 1997).

Water efficiency related technologies from the border institutions' perspective therefore cannot be considered as a managerial stewardship discharging mechanism, but rather "immoral" exercises (Douglas & Wildavsky, 1982, p. 67) with "moral defects" (Douglas & Wildavsky, 1982, p. 7). Furthermore, BHP OD's water

efficiency indicator, supported by the South Australian government represents short-term economic value for mining production, which is fundamentally incommensurable with the long-term environmental value of the GAB groundwater resource. This "monetarized" GAB water value (Douglas & Wildavsky, 1982, p. 95), according to Jones and Solomon (2013, p. 677), does not "capture the environmental consequences of an organisation's activity", therefore does discharge environmental responsibility (Christie et al., 2013; Jones, 2010).

In the logological analysis, as Thompson and Rayner (1998) assert, current economic development with the assistance of advanced technologies, implies the promise of the satisfaction of endless consumerist wants but fails to meet real human needs. In this case, border institutions consider excessive development of mineral resources with water efficiency related technologies as unnecessary and wasteful. This argument reflects border institutions' moral accountability as it is concerned with the community within which private entities and governments are situated. A community that defines "whose needs count and whose goods are sought" (Shearer, 2002, p. 546). Moral accountability requires relations to others and necessitates mutual understanding beyond the giving and receiving of accounts through the formal categories provided by managerial and administrative accountability (Messner, 2009). In this case, moral accountability calls for negotiation, explanation and articulation through processes of political participation in regards to mining development (Lehman, 1999)

Criticisms from border institutions reflect a common viewpoint of critical accounting researchers. That is, the social and environmental reporting practices in the form of 'business-as-usual' and 'middle of the road' approaches, instead of rendering organisational transparency and social and environmental sustainability, manifest as an obstacle to obfuscate antagonism and conflicts among different social segments (e.g. Spence, 2007).

According to Cooper and Sherer (1984) and Roberts (1991), accounting and reporting practices are neither neutral nor objective but rather serve an ideological function to legitimate particular interests and behaviours. Cultural risk theory, by suggesting assumptions such as attitude towards technology, view of risk and risk

resolution are shaped by institutional beliefs and interests, provide us with a critical lens to analyse the contested nature of the managerial stewardship concept with its related financial, social and environmental responsibility. In this theme, the centre institutions-the South Australian government and BHP OD's assumptions of risk attitude and the preferred technology has conferred institutional legitimacy on the fulfilment of managerial stewardship of the GAB water resource in terms of financial, social and environmental responsibility. The border institutions, by challenging those taken-for-granted assumptions, provide us with the opportunity to reconsider the mainstream managerial stewardship concept and its compliant role in attributing to the ecological degradation.

8.5 **Summary**

This chapter analysed the institutional debate of the GAB water risk through contested disclosures among Market (BHP, BHP OD), Hierarchy (Australian Federal and South Australian governments), and border institutions (civil society), using three major concepts from cultural risk theory with the application of Burkean rhetorical criticism. From this analysis, different institutional perspectives with respect to the attitude towards water efficiency related technology, view of the GAB water risks and resolution of risk, and their implications for accounting concept of control and related accountability are elucidated. The following chapters analyse different institutional positions in the GAB water risk debate using another three major concepts - cause of ecological crisis, view of justice and fairness and properties of desired system from cultural risk theory, and discuss their implications for accounting concept of economic consequences and related accountability.

CHAPTER 9 CAUSE OF ECOLOGICAL CRISIS, VIEW OF JUSTICE AND FAIRNESS AND PROPERTY OF DESIRED SYSTEM

9.1 Introduction

The preceding chapter applied three major concepts - attitude towards technology, view of risk and resolution of risk to analyse the institutional debate with regard to the Great Artesian Basin (GAB) water related risks and discussed these implications in terms of the accounting concept of stewardship and related accountabilities. Stewardship is a function of the concept of control as discussed in Chapter 7. This chapter applies the three major concepts from cultural risk theory- the cause of ecological crisis, view of justice and fairness and property of desired system to understand the concept of economic consequences from an institutional perspective.

As suggested by Douglas (1985, p. 92), different institutional structures identify some risks while obscuring others. In a Burkean grammatical analysis, institutions tend to clarify certain sets of problem, such as the cause of ecological crisis. These different perspectives toward the causes subsequently generate distinctive views of justice and fairness. These two concepts form various properties of a desired system that is explored in the Burkean logological analysis. This analysis provides insights to facilitate and justify government intervention in financial accounting and reporting practices in an era of looming environmental crisis. The three-level analysis of institutional perspectives and the critical theme of accounting and related accountabilities are displayed in Table 9.1.

Table 9.1 Cause of Ecological Crisis, View of Justice and Fairness, Properties of Desired System and Economic Consequence

	Market Institutions	Hierarchy Institutions	Border Institutions
Grammatical Analysis (Discursive features)			
Cause of Ecological Crisis	Government Intervention	Loss of Control	Inequitable System
	The proposed water levy as an inaccurate and misguided economic policy serving as a major obstacle to sustainable development.	Plan and organise water planning and management activities to control market forces, and collect NRM water levy to fund these activities to prevent water resource degradation	The free and over-extraction of the GAB water resource for mining operation is a symptom of a wider social imbalance. The allocation of the GAB water resource in favour of market and government short-term economic interests reflect wider social issues in terms of humanity and equality
Economic Conse-quence	The government's proposed water levy is 'unequal' and brings disastrous economic and social consequences, since it is a 'disincentive' to efficient water use	The water levy proposed restricts mining activities by realigning the private, social and environmental cost to remedy the problem of externalities	The wider social ill and imbalance manifested through legal exemptions granted to BHP OD brings detrimental social and environmental consequences
Rhetorical Analysis (Discursive functions)			
View of Justice and Fairness	Equality of Opportunity	Equality before Law	Equality of Condition and Result
	Believe fair-play in an unfettered market. Mining industry should not be required to pay the proposed water levy due to its investment in water planning and management services through regulatory and voluntary initiatives	Believe a fair distribution ranked by a need for solidarity and maintenance of the system. Propose to increase the water levy on industrial users because of 'the capacity to pay' principle	Favour a voluntaristic and egalitarian life-style. The current inegalitarian social system is manifest through unjust and unequal legal privilege that BHP OD is entitled. This 'dehumanised' relationship needs to be stopped to protect the GAB water resource and related communities
Economic Conse-quence	Take positive assumptions into consideration for an equal water levy proposal and assume common/public good as the outcome of the free exchange that can be achieved by pursuit of private interests	Take normative values such as humanity and ethics into consideration of their proposal of an 'unequal' water levy for the common/public good	Incorporate (more radical) ethical dimensions into account. Both water levy proposals from centre institutions exclude social and environmental costs, such as those of social solidarity and equity
Logological Analysis (Discursive implications)			
Properties of Desired System	Free Market	Governance and Planning	Social and Environmental Equity
	A firm faith in a competitive free market and the survival of the fittest principle. It does not want to take responsibility for cost recovery failure from those less productive water using sectors	Although hierarchical rules facilitate top-down (cost) reallocation, it attempts to punish sectors responsible for economic value creation and reward sectors with less economic success. Social equity is neither possible nor necessary	The legal framework for operation and development of Olympic Dam points to the 'moral defect' of the socio-economic system of the centre institutions. A belief in human goodness requires individuals begin as equal and end up as equal
Economic Consequence	Advocate an equal water levy to support the objectives of a competitive and economically efficient market. Not recognise nor realise GAB water conservation, the equal right to access of water and a strong bonded democratic society	Propose an 'unequal' water levy to redistribute or reallocate a part of the wealth from mining industry to assist the vulnerable stock and domestic sectors for the management of GAB, in order to satisfy social needs and perception of doing the right thing	Urge the charge and eventual phase out of BHP OD's GAB water extraction for resource reallocation and wealth redistribution for restoration of a democratic society
Accountability	Managerial Accountability	Administrative Accountability	Moral Accountability
	Restrict social relations to economic terms portray human identity as purely economic subjects pursuing self-interests. It serves to negate the very obligation to broader social and environmental distributive justice as it does not account for costs beyond the monetary value	Preservation of the GAB water resource in good condition so as to provide social and environmental benefits to the public in perpetuity. However it is vested in agreed procedures and rules supported by regulatory coercion, more concerning with political pragmatism and acceptance than social and environmental equity and justice	A fundamental and more encompassing form of accountability to cover the ethical requirement of accountability to the other. It requires an identity answerable to wider social interest and it encompasses wider scope of common/public good apart from the private good

This chapter begins with an analysis of the cause of the ecological crisis, view of justice and fairness and properties of desired system from the market and hierarchy (centre) institution (Section 9.2) before the explication of the border institutions (Section 9.3). The concept of economic consequences and associated issues of accountability are then discussed with insights for financial accounting and reporting practices.

9.2 Cause of ecological crisis, View of justice and fairness and Properties of desired system of centre institutions

In this chapter, BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD) and the Australian Federal and South Australian government's risk perspectives are mainly represented through the Minerals Council of Australia (MCA) and government agencies including Australian Competition and Consumer Commission (ACCC) and the South Australian Arid Lands Natural Resources Management (SAALNRM) Board. In the previous chapter, the risk perspectives of the market and hierarchy were combined as centre cultures (Douglas & Wildavsky, 1982). However, as the evidence issued by market and hierarchy institutions are in opposition in this case, the risk perspectives from the centre institutions are analysed separately.

With regard to the cause of the ecological crisis, hierarchy institutions perceive it that a lack of governance and planning has led to an inability to control unbridled economic growth (Ney & Thompson, 2011; Thompson & Rayner, 1998). In contrast, market institutions understand the ecological crisis as deriving from misguided government economic policy (Thompson & Rayner, 1998). With respect to the view of justice and fairness, hierarchy institutions seek to coordinate social groups "without violating status differentials" (Schwarz & Thompson, 1990, p. 6), since fair distribution is ranked by needs (Ney & Thompson, 2011). Hierarchy institutions have confidence in "sacrificing few for the good of the whole" (Douglas & Wildavsky, 1982, p. 101). On the contrary, market institutions emphasise individual autonomy and prefer the rules of fair-play (Douglas & Wildavsky, 1982; Ney & Thompson, 2011; Schwarz & Thompson, 1990). In respect of properties of a desired system, while hierarchy institutions "adopt a limited redistributive ethic…limiting exchange so as to limit losers" (Thompson et al., 1990, p. 61); market institutions

accept social inequities among social groups as long as fair competition and free exchange systems are not hampered (Douglas & Wildavsky, 1982).

9.2.1 Grammatical analysis - Cause of ecological crisis of hierarchy institutions

As Thompson and Rayner (1998) suggest, the importance and purpose of governance with regard to economic life and environmental crisis can be traced back to the hierarchy institutions' view of nature. Despite the view that nature serves to meet human needs and wants, hierarchy institutions do not see nature as infinitely resilient (Thompson & Rayner, 1998).

Hierarchy institutions are agents who construct the cause of ecological crisis as a lack of governance and planning (Ney & Thompson, 2011). From this perspective, economic life in terms of resource allocation, production and consumption of goods and services "should not be left to the free interplay of market force" but rather subject to central planning (Ney & Thompson, 2011, p. 611). To facilitate the implementation of the National Water Initiative (NWI) (see Chapter 2, Section 2.3.4), the Federal government established a NWI steering group which includes "representatives from federal, state and territory governments and some of their water pricing regulators" to plan and organise a wide range of water planning and management activities, aiming to support water use while maintain the health of the ecosystem (Australian Competition and Consumer Commission (ACCC) 2009, p. 5).

Broadly speaking, water planning and management activities include "the administration of water entitlements, developing plans and frameworks to allocate the resource, activities to address the impact of water use" (ACCC, 2009, p. ix). More specifically, they cover "implementing these plans/strategies frameworks and monitoring compliance against the plans"; "collecting and analysing data to gain a better understanding of the levels of extractions as well as the potential implications of extraction for the water system, and managing this data"; and "undertaking capital works, such as the modification of weirs to achieve environmental outcomes" (ACCC, 2009, p. 6).

For example, the NWI steering group, as a hierarchy institution, undertakes water planning and management activities (ACCC, 2009). Some water planning and management activities "predominately focus on generating economic benefits for a

particular water user or group of water users", for example, "a program to increase water use efficiency" (ACCC, 2009, p. 6); others are "undertaken mainly to benefit the environment", for example, "setting a limit on water extraction for consumptive and [industry] use" (ACCC, 2009, p. 6). At times, "one activity may be undertaken to address a number of different needs" (ACCC, 2009, p. 6). Therefore, the hierarchy does not see utility-maximisation as the primary rational because unbridled economic growth can be harmful to the environment (Thompson & Rayner, 1998).

In addition to national level policies, the SAALNRM Board, as the South Australian government agency, takes responsibility for implementing water planning and management activities. As a hierarchy institution, it is "afraid of upheavals which escape from a rational order and they fear for the life in the organisation" (Douglas & Wildavsky, 1982, p. 91). For example, the SAALNRM Board (2009b, p. 7) proposes a vision for the South Australian Arid Lands Region as "a healthy functioning ecosystem with sustainable industry and vibrant communities", and it emphasises

> the need to monitor and evaluate [water] resource change over the short, medium and long term, at regional and local scales and to evaluate and adopt [water planning and management activities] accordingly (SAALNRM Board, 2009b, p. 17).

Similar to the NWI steering group, the SAALNRM Board, as a hierarchy institution, supports rational management of both the economy and the environment to prevent the detrimental effects of excessive economic activity (Thompson & Rayner, 1998). More specifically, it collects a Natural Resource Management (NRM) water levy based on the rationale that "the licence holder has an entitlement right to access the resource and should contribute to the cost of its management based on the size of their entitlement" (SAALNRM Board, 2009b, p. 13). Without this "ongoing [water] planning and management [activities], the water resource will deteriorate in both quantity and quality with ramifications to ecosystems and water users" (SAALNRM Board, 2009b, p. 14).

According to cultural risk theory, this water pricing scheme/water levy charge can be seen as a mechanism to expand government control through its interference with market institutions, such as corporations (Ney & Thompson, 2011). It represents a

"explicit control" upon which hierarchy institutions rely (Douglas & Wildavsky, 1982, p. 180). By forming a "bureaucratic structure", this water pricing mechanism will "rectify the short-termism and greed" of the market, and lead to sustainable water resource management (Ney & Thompson, 2011, p. 45).

To conclude the grammatical analysis, while the NWI steering group centrally plans and organises a wide range of water planning and management activities to control "the free interplay of market force[s]" (Ney & Thompson, 2011, p. 611), the SAALNRM Board collects the NRM water levy to fund these water planning and management activities to prevent water resource degradation. This water levy charge, as a water pricing scheme, is considered as an instrument which forms a "bureaucratic structure" for governments to: expand their control through interference with corporations (Ney & Thompson, 2011, p. 45); to manage both the economy and the environment; and, to prevent the detrimental effects of excessive economic activity (Thompson & Rayner, 1998).

9.2.2 Grammatical analysis - Cause of ecological crisis of market institutions

Market institutions are agents that do not take environmental problems seriously (Ney & Thompson, 2011). For them, the present "ballyhoo" over environmental issues is considered "much ado about nothing" (Ney & Thompson, 2011, p. 47). In this case, from market institutions (BHP OD and the MCA)[54] perspective; the hierarchy institutions, the ACCC and the SAALNRM Board's plans to raise funds for water planning and management are unnecessary and simply misrepresent the impact of the mining industry's water usage.

For example, while the MCA (2009a, n.p.) acknowledges that water is "a critical business input for all operations" in the mining industry, it describes itself and its members as "having a long-standing commitment to sustainable development and the effective management of Australia's water resource". From the MCA's (2009a, n. p.) perspective, the mining industry is "a very small [water] consumer" which was "responsible for 2.4% of Australia's net water consumption" during 2004-05, and is also "a temporary user of water, often in areas where there are no competing industrial uses" (Australian Bureau of Statistics, 2012). Notwithstanding, "one of the

[54] It is important to note that in Sections 7.2.3 and 7.2.4, BHP OD's perspective partly represented through the voice of MCA, as the MCA "represents over 85% of minerals production in Australia" including BHP (Minerals Council of Australia, 2009a).

highest value users of that water" (Minerals Council of Australia, 2009a, n. p.). Table 9.2 below shows water consumption and industry gross value added by various industry for 2004-2005.

Table 9.2 Water consumption and Industry Gross Value Added by Industry

	IGVA ($m) [Industry Gross Value Added]	Water Cons. (GL)	IGVA (%)	Water Use (%)	IGVA/Vol Cons. ($m/GL)
Agriculture	$24,344	12,191	3	73	$2.00
Forestry and fishing	$2,347	51	0	0	$46.02
Mining	$64,223	413	8	2	$155.50
Manufacturing	$99,688	589	13	4	$169.25
Water supply	$7,407	2,083	1	13	$3.56
Electricity and gas	$14,444	271	2	2	$53.30
Other industries	$577,333	1,059	73	6	$545.17
Total	$789,786	16,657			

Source: ABS Data for 2004-2005 in MCA (2009a, n. p.)[55]

Regarding GAB water consumption related productivity, Torrisi and Trotta (2009) draw on the National Water Commission (2009) and note that the total value of production from the GAB in 2009 was approximately AUD$4 billion with AUD$1 billion from agriculture, AUD$1 billion from petroleum, and AUD$1 billion from mining and a small but increasing value from tourism. (Market institution - BHP OD as a small GAB water consumer is discussed in Chapter 5, Section 5.2.1). Furthermore, Torrisi and Trotta (2009, p. 196) point out that the GAB water

[55] This data is consistent with the National Water Account (Australian Bureau of Statistics, 2012). During 2010-11, the Australian economy has extracted 71.796 GL of water from the environment. Agriculture industry accounted for 54% of Australia's total water consumption as the largest water users. The mining industry consumed 4% (540GL) of the total water volume, which is similar to 5% (651GL) of the total water consumption from the manufacturing industry. More specifically, Australian Bureau of Statistics (2012, n. p.) documents that:
"[T]he mining industry consumed 10% more water in 2010-11 than it did in 2009-10. However the industry also recorded a total of [AUD] $243 million of gross value added per GL of water consumed, a 25% increase from 2009-10. Gross value added far outweighed the increase in consumption, demonstrating the efficient, high value-add proposition of the minerals sector's use of water nationally…Compare this to the agriculture industry, which generated a total of [AUD] $4 million of gross value added (on average) for every GL of water consumed in 2010-11 and the manufacturing industry, which generated a total of [AUD] $166 million of gross value added for every GL of water consumed, a 1% increase from 2009-10."

demanded by BHP OD's Olympic Dam Expansion Project (ODEP) would decrease in the long run:

> With coastal desalination the preferred option for water supply to the proposed expansion of Olympic Dam to open pit mining, the relative proportion of water demanded by Olympic Dam … is expected to decrease over time as other uses grow in demand particularly from other possible mining and geothermal operation.

BHP OD has also described itself as a responsible and productive water user. For example, while being "acutely aware" that the GAB is "a scarce resource", BHP OD has "a group of engineers dedicated to identifying and implementing initiatives that reduce water consumption" (Dornin, 2007, n.p.), so as to "progress… development in a sustainable way" (BHP Billiton, 2007a, p. 175).

According to Thompson and Rayner (1998), the market institution perceives distorted prices for resources, as a result of misguided government economic policies, as the cause of the ecological crisis. In this case, the proposed unequal water levy by the SAALNRM Board is constructed by the MCA as government interference which serves as a major "obstacle" (Thompson & Rayner, 1998, p. 299) to achieving sustainable development.

For example, MCA (2009a, n. p.), the capacity-to-pay principle outlined by the SAALNRM Board (2009b) has "contributed equally to the externalities being addressed" and "failed to recognise [that] the externalities for which the levies are proposed are already internalised for the minerals industry through other regulatory instruments". This internalisation includes the costs for water planning and management activities borne by water users through the states' regulatory instruments; and, business voluntary initiatives that "demonstrate leadership by internalising costs of environmental externalities" (Minerals Council of Australia, 2009a, n. p.). For example, BHP OD is required to submit an annual Environmental Management and Monitoring Report (EMMR) and an annual GAB Wellfields Report to the South Australian Department of Primary Industry and Resources (PIRSA) for BHP OD's operation (BHP Billiton, 2009, 2011a) (see Chapter 6, Section 6.2.1). BHP OD has also participated in the GAB Sustainability Initiative Program initiated by the Federal government and the South Australian government between 1998 and 2004 (Torrisi & Trotta, 2009) (see Section 9.2.4).

According to the MCA (2009a, n. p.), business investments generate products which are "provided directly to governments, to support their responsibilities for the sustainable management of water resources including planning activities" (Minerals Council of Australia, 2009a, n. p.). For example, BHP OD conducts groundwater monitoring quarterly and collects data about the hydrogeology of the GAB around the region of wellfields. This data set is shared with government authorities and researchers for reporting and study purposes (Torrisi & Trotta, 2009) (see Chapter 8, Section 8.2.2). Since these industry investments represent "a substantial contribution" to water planning and water management activities, "the pricing for access to water should appropriately reflect the investments made by industry" as long as these investments continue (Minerals Council of Australia, 2009a, n. p.).

Therefore, from the MCA's perspective, the cause of the ecological crisis emanates from an inaccurate water pricing mechanism. As Thompson and Rayner (1998) argue, this is an explicitly technical argument for environmental issues which focuses on a natural resource price mechanism. In other words, market institutions assume that markets occur naturally and the demand-supply-price mechanism is objective and value free (Hines, 1989). Market institutions, therefore, construct resource management as a debate of "scarcity and cost" (Thompson & Rayner, 1998, p. 298).

In the case of water scarcity, the GAB groundwater resource should be valued highly to cover the increasing cost of water planning and management activities. If reflected accurately in the water levy, it should influence the decision making of water users because of the effect of market forces such as "substitution, technical innovation, and structural change" (Thompson & Rayner, 1998, p. 296). In order to compete in the market, strategies need to be adopted and behaviours have to be changed by water users to minimise costs. Conversely, if a resource is undervalued, that is, its scarcity is not reflected through the resource pricing scheme, this resource will tend to be over utilised (Thompson & Rayner, 1998).

For the MCA, the unequal water levy represents a "disincentive" (Thompson & Rayner, 1998, p. 299) to efficient water use by providing free water access to stock and domestic users. Because it encourages overuse and results in water resource

degradation, the MCA raises "significant concerns that should water charging rules be applied in the same manner to all industries and users" (Minerals Council of Australia, 2009a, n. p.). Water levies,

> if enacted, would promote barriers to establishing efficient markets, and at worst, potentially provide windfall gains to stock and domestic users when a water market is established (Minerals Council of Australia, 2009a, n. p.).

The failure to internalise environmental costs from the market institution's perspective, contributes to environmental degradation, because the environment is only protected when the true (economic) value is achieved (Thompson & Rayner, 1998).

According to Ney and Thompson (2011), institutional regulations or hierarchical interventions that align with the objectives of an unfettered market are advocated by market institutions (Ney & Thompson, 2011). Such regulations support competition, prevent resource loss (Douglas & Wildavsky, 1982) and therefore bring overall social benefits such as technological innovation which, in turn, enlarges production scale (Thompson & Rayner, 1998). In this case, the MCA (2009a) emphasises the importance of an equitable and economically efficient market, and its focus is to "support the removal of barriers to trade, [and] promote sustainable development within the Basin" (Minerals Council of Australia, 2009a, n. p.).

To conclude the grammatical analysis, the MCA and the BHP OD, as market institutions, perceive the ACCC and the SAALNRM Board's plan to raise more funds for the water planning and management activities for the GAB water protection as "much ado about nothing" (Ney & Thompson, 2011, p. 47). The mining industry in general and BHP OD in particular, consider themselves as small, productive and responsible water users. With respect to the cause of the ecological crisis, the MCA views the proposed water levy by the SAALNRM Board as an inaccurate and misguided economic policy which serves as a major "obstacle" (Thompson & Rayner, 1998, p. 299) to sustainable development. It argues that the minerals industry has already borne the costs for water planning and management activities through the States' regulatory instruments and business' voluntary initiative. The unequal water levy is viewed as a "disincentive" (Thompson & Rayner, 1998, p. 299) to efficient water using behaviour by providing free water

access to stock and domestic users, and therefore encouraging overuse and water resource degradation. For that reason, the MCA advocates an equal water levy for all water users to support competition and prevent resource loss in accordance with objectives of an economically efficient market (Ney & Thompson, 2011).

9.2.3 Rhetorical analysis - View of justice and fairness of hierarchy institutions

Drawing upon their construction of a lack of central planning and control as the cause of the ecological crisis, hierarchy institutions exploit the strategy of identification with the public interest by promoting planning to limit present consumption and accumulate capital for benefits of social and environmental justice in the long-run (Thompson et al., 1990). The SAALNRM Board plans to collect funds from the current water levy to cover ongoing water planning and management activities to prevent water resource degradation. For example, according to the ACCC (2009), the SAALNRM Board has the power to charge a NRM water levy to water access entitlement holders through water licensing systems.

Hierarchy institutions consequently discursively establish a hierarchy or social order with respect to a particular view of justice and fairness based on fair distribution ranked by needs (Ney & Thompson, 2011) funded in the confidence in "sacrificing few for the good of the whole" (Douglas & Wildavsky, 1982, p. 101). The SAALNRM Board proposes an 'unequal' pricing mechanism to cover the cost of ongoing water planning and water management activities. Industrial users are required to pay a higher water levy due to their higher economic value creation (increased profit) while stock and domestic users are exempt. The reason for proposing a higher water levy on industrial users is the 'capacity to pay' principle. As the SAALNRM Board (2009b, p. 14) explains,

> the largest levy payer will be OZ Minerals with about [AUD] $291,000 per year. This company has started mining and processing gold and copper at Prominent Hill. It has spent around [AUD] $30m in providing suitable aquifer water to the site. The company expects to mine and process each year 104,000 tonnes of copper and 115,000 ounces of gold. At today's prices this is a gross income of nearly [AUD] $660 million. Thus their levy is 0.05% of gross income. Another levy payer is expected to be Heathgate Resources - Beverley at an estimate [AUD] $11,000. Based upon present production levels this levy will be around 0.12% of gross income.

As such, priority is given to the solidarity and maintenance of the system as a whole (Ney & Thompson, 2011).

> In the hierarchical worldview, nobility obliges. That is to say, differences of rank, status, influence, and wealth exist and are quite acceptable, as long as those at the top make a concerted, genuine effort to shelter those at the bottom from the vagaries of life (Ney & Thompson, 2011, p. 66).

To conclude the rhetorical analysis, the SAALNRM Board as a hierarchy institution maintains a belief that a current sacrifice will lead to the future gain (Thompson et al., 1990). They propose to increase the water levy on industrial users because of 'the capacity to pay' principle, to present fair distribution in society ranked on a need for solidarity and maintenance of the system (Ney & Thompson, 2011).

9.2.4 Rhetorical analysis - View of justice and fairness of market institutions

Since the pricing regulation is the cause of ecological crisis, market institutions are competitive actors that create extra wealth to benefit themselves and others (Thompson et al., 1990). This assumption is characterised by a laissez-faire attitude that emphasises individual autonomy and the resultant freedom with respect to needs and wants (Ney & Thompson, 2011; Schwarz & Thompson, 1990).

Unlike hierarchy institutions, which are in favour of institutional rules, market institutions prefer rules for fair-play (Douglas & Wildavsky, 1982). In this case, responding to the water planning and management activities and the proposed water levy from the SAALNRM Board, the MCA (2009a, n. p.) highlights "a critically important point of difference" between the mining industry and other water users.

> Unlike other users of water, the industry is heavily regulated in all aspects of water access, storage, use, reuse and disposal, and the intersection of the existing regulatory frameworks and the water reform process is yet to be understood and reconciled by governments (Minerals Council of Australia, 2009a, n. p.).

Indeed, as the MCA (2009a, n. p.) demonstrates, the mining industry "invest[s] significantly" in water planning and water management services through "a variety of regulatory, co-regulatory and voluntary initiatives". Many of these investments "are provided to governments to support their broader water management mandate".

According to the MCA (2009a, n. p.), while the mining industry "supports the user-pays principles" (see Section 9.2.5) proposed by the government agency such as the

ACCC, it is "already paying through investments" in water planning and management activities such as: modelling, impact assessment and stakeholder engagement; metering and monitoring including volume, quality and community expectations; reporting, including data and records in the form of reports provided to all jurisdictions; and adaptive management including the intellectual capacity to improve water use efficiency and reduce or remediate negative environmental impacts arising from water use and ongoing research initiatives (Minerals Council of Australia, 2009a, n. p.).

The MCA (2009a, n. p.) notes that there are also "capital and corporate service costs associated with" the above-mentioned activities. Capital costs include the provision of infrastructure and systems such as stream flow gauging stations, control weirs, monitoring bores, and water registers. Corporate services include corporate services delivery and corporate planning functions such as communication, human resources, legal, IT, financial management and records management, business and strategic planning and performance review against these plans (Minerals Council of Australia, 2009a, n. p.) Referring to the user-pays principle as advocated by the ACCC (see Section 9.2.5), the MCA (2009a, n. p.) maintains that "these cost should be aligned with the activities to which they relate, rather than appearing as separate activities".

Such investments from the mining industry in water planning and management activities are evident in the BHP OD's case. For example, Torrisi and Trotta (2009, p. 204) indicate that "the supply of water to the mine and the continuous improvement in industrial water efficiency of demand incur a significant financial cost to the business", and this "financial commitment" of the company is "a reflection of the accountability to deliver the sustainability of water use". More specifically, according to BHP Billiton (2011a, p. 115), BHP OD has "invested significant capital development of the GAB wellfields and associated pumping stations and pipelines". BHP OD also "committed significant quantities of operating and capital expenditure to engineering contractors to identify and implement water saving projects" (Torrisi & Trotta, 2009, p. 202).

Apart from the mining operation itself, BHP has participated in the GAB Sustainability Initiative Program initiated by the Federal government and South

Australian government between 1998 and 2004 (more detail see Chapter 2, Section 2.4.1) (Torrisi & Trotta, 2009). It has "directly funded, project-managed or contributed to" the capping free-flowing bores, the installation of close-pipe reticulation systems, and bore remediation programs within the GAB (BHP Billiton, 2011a, p. 114). A total fund of AUD$2.2 million was spent on these projects which has "resulted in savings of around 37 megalitres per day [ML/d] since 2004 in the vicinity of the Olympic Dam wellfields" (International Council on Mining and Metals (ICMM) 2012, p. 19). Again in 2009, BHP Billiton "purchased two pastoral properties in the north of the wellfield area and shut down several free-flowing bores" which has given rise to the "further savings of 5ML/d" (ICMM, 2012, p. 19). According to BHP Billiton, this overall amount of water saving

> is greater than the annual average GAB usage over the same period, and is also more than the amount of water currently extracted from the GAB for use at Olympic Dam and Roxby Down (currently 33 ML/d).

Therefore, BHP Billiton (2011a, p. 114) perceives the water levy imposed on the mining industry, is unfair and unjust. As Ney and Thompson (2011, p. 37) contend, fairness for market institutions mean that "those who put the most in get the most out". The role of market agents is consequently enacted through framing public interest in competitive free markets which is constructed to "select the best and reject the worst" (Douglas & Wildavsky, 1982, p. 99). Thompson and Rayner (1998, p. 300) assert that, for market institutions, "what is good for market efficiency is good for the environment, increased efficiency means less waste and a more careful use of resources".

To conclude the rhetorical analysis, the market institution, the MCA believes that fair-play resides in an unfettered market (Douglas & Wildavsky, 1982). Therefore, justice in the mining industry is achieved when they are not requested to pay the proposed water levy because of their substantial commitment to investment in water planning and water management services through a wide range of regulatory and voluntary initiatives.

9.2.5 Logological analysis - Properties of desired system of hierarchy institutions

Hierarchy institutions construct the loss of government control as the cause of ecological crisis and identify their concept of justice and fairness as equality before

law. Therefore they use 'governance and planning' as the terministic screen with regards to the properties of their desired system and to legitimate their preferred social order.

According to Thompson, et al. (1990) and Douglas and Wildavsky (1982), hierarchy institutions prefer to use direct instrumental rules/bureaucratic means to allocate resources by physical quantities. In this case, the ACCC (2009) prefers to allocate NRM water levy charges according to an individual's or groups' water use. For example, the water levy charging principle, ACCC (2009, p. 21) indicates that "all costs associated with water planning and management must be identified" and "water planning and management charges are to be linked as closely as possible to the costs of activities or products".

For the ACCC, this user-pays principle enforces the importance of improved transparency for the cost and charges of water planning and water management activities. This user-pay approach could:

> advance the water charging objective of achieving pricing transparency in respect of cost recovery for water planning and management through the publication of increased and consistent information about water charges and the reporting and improved information about water planning and water management costs and cost recovery arrangements (ACCC, 2009, p. ix).

Following the user-pay approach, the SAALNRM Board (2009b) proposed to increase the NRM water levy from 1c/kl in 2006/2007 to 6.5c/kl for industrial users (including the mining sector) issued with water licences. This increased water levy imposed on the mining industry is consistent with the speculation that "the need for water for mining is expected to increase significantly over the next 5-10 years" (SAALNRM Board, 2009a, p. 38).

It is important to note that this increased water charge will have direct impacts/economic consequences for the ODEP. Although BHP OD has not been charged any GAB water cost due to the privileges under the *Roxby Downs (Indenture Ratification) Act* (1982)[56], this proposed amendment to the water levy would come into effect as one part in the Roxby Downs (Indenture Ratification)

[56] South Australian government has issued two water licences (Roxby Downs (Indenture Ratification) Act 1982) (see Chapter 6, Section 6.2.1) to BHP OD's predecessor WMC to "provide certainty of water supply for the [mining] development" (SAALNRM Board, 2009b, p.13).

(Amendment of Indenture) Amendment Act (2011) for ODEP. In other words, it will increase BHP OD's liability/expense and therefore negatively affect equity/capital/profitability when the ODEP takes place.

According to Douglas and Wildavsky (1982, p. 180), notwithstanding that hierarchical rule facilitates top-down (cost) reallocation, it is not concerned about the "contradiction among the founding principles or incompatibility between them and the way of life they justify". This is because hierarchical rules attempt to punish sectors responsible for economic value creation and reward sectors with less economic success (Ney & Thompson, 2011). In this case, despite the ACCC's user-pays principle and the proposed increased water levy on industrial users, the SAALNRM Board provides an "exemption from the levy for any water allocated for stock and domestic purposes", as stock and domestic users have not been issued water licences [57] (SAALNRM Board, 2009b, p. 12).

Hierarchy institutions therefore create and maintain hierarchising and separating effects which (re)produce social division. The various social groups, such as industrial, stock and domestic users are considered to be bound "in an orderly and ranked relationship". The role of the hierarchy institution is to merely to coordinate these groups "without violating status differentials" (Schwarz & Thompson, 1990, p. 6) through the water levy system. What the hierarchy institution attempts to create, therefore, is "a procedural rationality that is more concerned with the properties of who does what than with trying to evaluate the outcome" (Schwarz & Thompson, 1990, p. 67).

As can be seen from this case, the SAALNRM Board aims to "behoove" (Ney & Thompson, 2011, p. 67) the affluent industrial sectors to assist vulnerable stock and domestic sectors. This is done in an effort to improve adoptive water planning and water management regarding monitoring, evaluating and reporting capacities to ensure that the deterioration of water resources with its ramifications to ecosystems and water users can be overcome. As such, as a hierarchy institution, the SAALNRM

[57] According to SA Murray-Darling Basin Natural Resources (2013a, p. 3) , "[w]ater used for stock and domestic purposes does not require a water licence. Stock use means watering stock, other than stock subject to intensive farming. Domestic purposes include water used for non commercial domestic purposes and irrigating up to 0.4 hectare of land used solely in connection with a dwelling, e.g. garden area." "Water used for stock and/or domestic purposes… does not need to be metered. This includes water from any source, including a well, dam, watercourse or rainwater tank" (SA Murray-Darling Basin Natural Resources, 2013b, p. 4).

Board "adopt[s] a limited redistributive ethic… limiting exchange so as to limit losers" (Thompson et al., 1990, p. 61).

To conclude the logological analysis, the ACCC prefers to use hierarchical rule (Douglas & Wildavsky, 1982) to allocate a NRM water levy charge according to the amount of water used in accordance with the 'user-pays-principle'. The SAALNRM Board implements these rules without regard to social equity (Schwarz & Thompson, 1990) by proposing to increase the water levy on industrial users to assist the vulnerable stock and domestic sectors.

9.2.6 Logological analysis - Properties of desired system of market institutions

While constructing government intervention as the cause of ecological crisis and identifying the concept of justice and fairness as the equality of opportunity, market institutions establish 'free market' as the terministic screen with respect to the properties of their desired system and to legitimate their preferred style of justice and fairness.

According to Thompson and Rayner (1998), the underlying market institutions' diagnosis of an environmental crisis is linked to a capitalist system that goes hand in hand with environmental protection and necessary growth for attaining sustainable development. It is consistent with the assertion of Ney and Thompson (2011, p. 37): "Adam Smith's invisible hand ensur[es] that people only do well when others also benefit".

Since market institutions have a firm faith that a competitive free market "select[s] the best and reject[s] the worst" (Douglas & Wildavsky, 1982, p. 99), they do not take responsibility for individual failures (Douglas & Wildavsky, 1982). In this case, the MCA (2009a, n. p.) maintains that the link between the user-pays principle and the investment made in water planning and management activities (either through water levies or planning and management services) is presently "not equal across all water users" and the user-pays principle is "twisted completely". According to the MCA (2009a, n. p.), the ACCC and SAALNRM Board expect the mining industry to "pay twice" for water planning and water management functions. In other words, a discrepancy exists between the mining industry and other water users regarding water metering, monitoring and reporting standards. Albeit "accounting for circa 80%

of water consumption in the Great Artesian Basin", domestic and stock users are "not required to monitor or report water use" while the mineral industry water users are under the concerns of policy makers to raise funds to cover the cost for water planning and management activities (Minerals Council of Australia, 2009b, p. 29).

As a result, the MCA (2009a, n. p.) suggests "the relative contributions of users to the water planning process, investments in infrastructure, and water volume and quality…to be factored into pricing arrangements". According to the MCA (2009b, p. 29), "with greater consistency across water users regarding metering and use, better strategic water resource planning can be implemented".

The MCA, as a market institution, does not want to "carry heavy fixed liabilities" (Douglas & Wildavsky, 1982, p. 101) for a less productive water using sector. As Douglas and Wildavsky (1982, p. 101) assert, "it holds that people responsible for their own misfortunes, stupidity and neglect explain their losses". As explained by Williams (1992), the existence and acceptance of a market system as the mainstream social economy is rooted in a fundamental assumption of human nature. That is, human beings are "self-seeking wealth maximisers" (Williams, 1992, p. 104). Another taken-for-granted assumption is that the industrial capitalist society is predicated on the fittest will survive principle (Hines, 1989). It is assumed that markets are arbitrated by an "invisible hand" of market forces in terms of free competition (Hines, 1989, p. 64). For market institutions, failures are attributed to individual incompetence and/or bad luck, while the competitive market remains smart and guiltless (Douglas & Wildavsky, 1982).

Market institutions therefore create hierarchising and separating effects producing and reproducing social divisions and inequities. Since market institutions espouse individual success and focus on the 'bottom line' only, temporary inequalities within social groups are accepted as long as fair competitions and free exchange systems are not hampered (means-end rationality). According to Douglas and Wildavsky (1982, p. 179):

> [Market institutions'] fundamental justification is not faith in the value of the individual but faith in the freedom to exchange… [l]ong term concentrations of wealth make it impossible to give honest answers to the challenge of envy: with wealth stabilised, the premise of equality is flouted.

In other words, market institutions value free competition, not the "relational niceties" of members within society (Schwarz & Thompson, 1990, p. 6).

To conclude the logological analysis, as the MCA has a firm faith in a competitive free market and the survival of the fittest principle, it does not want to take responsibility for other cost recovery failure (Douglas & Wildavsky, 1982) from those less productive water using sectors such as the stock and domestic users.

As a result of the MCA's (2009a, 2009b) comments on increased industrial water levy and water charge rules for water planning and water management activities in particular, and the border institutions comment through public submissions on BHP OD's legal privileges under the *Indenture Act* (1982) (Section 9.3), an industrial water levy of 3c/KL[58] has been approved by the SAALNRM Board (2009b). The stipulation of this water levy has come into effect as section 13(12) in the Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act (2011) for ODEP. The GAB water charge will be based on this approved levy rate "capped at $0.101KL… for 30 years from the commencement of the project. The charge will then revert to the current NRM levy rate" (Government of South Austrlia, 2011a, n.p.; see also Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011).

9.3 Cause of ecological crisis, View of justice and fairness and Properties of desired system of border institutions

This section considers the border institutions' perspective of the cause of the ecological crisis, view of justice and fairness and properties of a desired system and the differences from both market institutions - the MCA and the BHP OD and hierarchy institutions - the ACCC and the SAALNRM Board. Evidence of the interests of the border institutions' is drawn from public submissions to ODEP EIS (BHP Billiton, 2009), media articles and academic references. These sources represent the view that: the cause of the ecological crisis is rooted in the socio-economic system as a wider social ill (Ney & Thompson, 2011; Thompson & Rayner, 1998); justice and fairness as "voluntaristic and egalitarian" and dependent upon "fraternal and sororal cooperation" (Schwarz & Thompson, 1990, p. 7); and, a

[58] The water levy is AUD$0.0318/KL (Roxby Downs (Indenture Ratification) (Amendment of Indenture) Amendment Act 2011).

desired system is characterised by 'social and environmental equity' (Schwarz & Thompson, 1990). This documentary evidence is often in the form of criticisms of the Indenture Ratification Act (1982) established between BHP and the South Australian government as a legal framework for the operation and development of Olympic Dam in general and BHP OD's legal privileges granted by the Indenture Ratification Act (1982) in particular.

9.3.1 Grammatical analysis - Cause of ecological crisis of border institutions

Border institutions are agents who consider the environmental crisis as a symptom of a wider social ill. From the border institutions' perspective, the abuse of nature is fundamentally related to social structures and values (Thompson & Rayner, 1998). This is consistent with Hines' (1989) argument that markets, demands, supply, price and cost are socially constructed. By making markets appear to be natural and therefore inevitable and neutral, they can be viewed as "part of an ideology which perpetuate and legitimate a world capitalist and industrialist order" (Hines, 1989, p. 64). It is this capitalist social order, from the border institutions' perspective, where the imbalance emerges (Ney & Thompson, 2011; Thompson & Rayner, 1998).

Therefore, environmental degradation can only be properly understood if it is seen as a symptom of a wider social ill. The way humans pillage natural resources recklessly is a significant indicator for other social malaise such as racism, gender discrimination, social alienation and so on (Ney & Thompson, 2011; Thompson & Rayner, 1998). In this case, an example of this social ill is evident in the way market (and hierarchy) institutions treat Aboriginal groups with regard to mining operations, as the Indenture Ratification Act (1982) is not restricted by the Aboriginal Heritage Act (1988) which is "designed to protect the health and wellbeing of the peoples" (Madigan M, CL 247, n.p.).

As emphasised by Hon. M. Parnell (Australian Greens, 2007, n.p.), the Aboriginal Heritage Act (1988) is "one piece of legislation which does not apply to Roxby but which would apply to any other miner in South Australia". It is also "the key legislative enactment aimed at protecting indigenous heritage in South Australia" (Friends of the Earth Adelaide, CL 44, p. 7). However, under the Indenture Ratification Act (1982), BHP Billiton [and its predecessor WMC] has been placed in

"a legal position to undertake any consultation that occurs, decide which Aboriginal groups they consult and the manner of that consultation" (Friends of the Earth Adelaide, CL 44, p. 8). As such, from the perspective of the border institutions, individualists and hierarchists in centre institutions are "the ideological standard bearers" of a devastating socio-economic system (Thompson & Rayner, 1998, p. 304). Lack of proper governance is also the root of the environmental crisis from the hierarchy institution (see Section 9.2.1) and is a symptom of underlying imbalances within the social world. In this case, border institutions view the allocation of the GAB water resource in favour of market and government interests as the cause of the GAB risk of crisis. According to Douglas and Wildavsky's (1982, p. 150), issues are "a confrontation between corporate [and governmental] technocratic domination and decentralized community independence." This view is closely associated with a broad range of issues from: the endangered mound springs to the cultural and spiritual damage to Aboriginal groups; the unfair water distribution to the likely draining of the GAB; and, the consequent catastrophic future of water shortage.

Border institutions construct social equity as the agent to address social imbalance in favour of justice, humanity and freedom from repression (Douglas & Wildavsky, 1982; Thompson & Rayner, 1998). This is "a holistic view" of the "whole spectrum of social and cultural activity" when it comes to diagnosing environmental problems (Thompson & Rayner, 1998, p. 295). In this case, border institutions urge the South Australian government to relinquish the "outdated" (Environment Centre NT, CL 35, n.p.) or "anarchistic" (Friends of the Earth Australia, 2011, n.p.) legal exemptions for BHP OD under the Indenture Ratification Act (1982) for ODEP.

Although the final decision of ODEP made by the Federal government and South Australian government requires BHP to "be levied for water extracted from the Basin, providing revenue that will enable the Government to better manage this precious natural resource" (News Release, 2011, n.p.), the Hon. M. Parnell is not completely satisfied with the hierarchy's requirement to cap charges for 30 years, because it "really just shows how unique and favourable this arrangement is. No one else - no other user of water, no irrigators, no other mining companies gets this concession" (South Australia, Legislative Council, 2011, p. 5). Therefore, the border institutions' objective of blocking this unjust allocation of water is not merely to

safeguard itself from any potential environmental crisis, but also to "break the stranglehold which they consider such interests have on society" (Douglas & Wildavsky, 1982, p. 150).

To conclude the grammatical analysis, border institutions consider the ecological crisis- the free and over-extraction of the GAB water resource for BHP OD's mining operation- is manifested through the legal exemptions that are granted to BHP OD under the Indenture Ratification Act (1982). From this perspective, the allocation of the GAB water resource in favour of market and government short-term economic interests which has been arranged under the Indenture Ratification Act (1982) will never resolve or relieve the GAB water-related environmental problem unless wider social issues in terms of humanity and equality are addressed. Border institutions therefore call for the relinquishment of the legal exemptions for BHP OD under the *Indenture Act* for ODEP. From this perspective, it is only through "a levelling of the fundamental inequity" (Ney & Thompson, 2011, p. 37) that is characteristics of the Indenture Ratification Act (1982) that the GAB water resource can be preserved.

9.3.2 Rhetorical analysis - View of justice and fairness of border institutions

While constructing an inequitable social system as the cause of the ecological crisis, border institutions promote identification with the public by framing themselves as moral agents who support policies to protect the environment without "exploitative values…and dehumanised relationships" (Douglas & Wildavsky, 1982, p. 135). For them, social relationships are said to be fundamentally dependent upon "fraternal and sororal cooperation" and therefore should be "voluntaristic and egalitarian" (Schwarz & Thompson, 1990, p. 7). Encroachment of a differential social status from a hierarchical lifestyle and unequal distribution of wealth and power from market institutions threatens this ideal state of justice (Thompson et al., 1990).

To highlight the border view of fairness and justice, the current and historic treatment of Aboriginal groups is used as a salient example. The Indenture Ratification Act (1982) constructs a "structural dependency" (Thompson & Rayner, 1998, p. 296) for Aboriginal groups on BHP OD's and its predecessor WMC's mining operation and it is a serious impediment to sustainable GAB water management. For example, according to Environment Tasmania Inc. (CL 37, p. 1),

WMC used "divide-and-rule tactics and exerted persistent, unwanted pressure until the mining company got what it wanted".

As Lad A (CL 233, p. 4) argues, Roxby Downs "began with the manhandling and forcible eviction of the Traditional indigenous elders [and this] speaks volumes…[about] this industry's scant regard for what is right and respectful". For example, in 1983, Kokatha men "had to defend a sacred site at Canegrass Swamp with guns from bigoted Roxby workers with a bulldozer building the Borefield Road" (Lad A, CL 233, p. 4)[59].

Friends of the Earth (CL 42, n.p.) describes another "particularly notorious incident in the history of the Olympic Dam mine" of laying a water pipe by WMC in the mid-1990s on the land of Arabunna Traditional Owners. "The dispute over this pipeline led to violence, terrorism, imprisonment, and the death of one person" (Friends of the Earth, CL 42, n.p.). While BHP cannot be held responsible for WMC actions, "it seems little has changed, including BHP B[illiton]'s refusal to relinquish the overrides and exemptions it enjoys from the Aboriginal Heritage Act" (Friends of the Earth, CL 42, n.p.). As Friends of the Earth Adelaide (CL 44, p. 8) states, "BHP Billiton clearly cannot participate in decisions concerning the recognition and protection of Aboriginal sites without a gross conflict of interest."

Indeed, according to Henderson K (CL 196, n.p.), "BHP continues to consult with the Arabunna in a selective manner embodying the racism inherent in Indenture Act". This "divide and conquer' technique", described by Henderson K (CL 196, n.p.) is "typical of corporate engagement strategies, which try to convince a usually unsatisfied and educated public that they have regard for environmental and social justice":

> According the Aboriginal Community Centre in Marree, ran by the Arabunna, splinter pro mining groups of Aboriginal people have been handpicked for consultation, whilst the rest of the community is ignored and shafted. …For the Arabunna who have strong ties to the Mound Springs … this is greatly distressing, as it is also for those of the general public who work to achieve trust

[59] According to Cooper (2010, p. 189), "[a]boriginal and environmental concerns about mining at Olympic Dam were first raised in 1979. In June 1980, it was alleged that clay pans adjacent to a proposed shaft site were of mythological significance. Such matters led Premier David Tonkin to note in November 1981 that only as a consequence of the Olympic Dam discovery was aboriginal interest attracted to the remote area. However, it was the construction of the bore field road across Canegrass Swamp, 50km north of Olympic Dam, in July 1982 that provoked the largest indigenous protest. It was only resolved in December after it was suggested that WMC might invoke the *force majeure* provision of their indenture and the Government approved $450,000 expenditure to reroute the road."

> between Aboriginal and white communities in order to foster a socially just future. (Henderson K, CL 196, n.p.)

In Arabunna Elder Kevin Buzzacotts' own words (ABC Premium News, 2011b, n. p.): "We don't want that big great gaping hole in the desert… because it is a sacred site and we're trying to protect our areas".

Like the Arabunna community, the Kokatha People's Committee "has not had the opportunity to be involved in the investigation or to provide further information" (Lad A, CL 233, p. 4).

Servethepeople (2008, n.p.) gives another example of the consultation process of BHP with the Kokatha people regarding the ODEP:

> At the moment, BHP is in a hurry to get signatures of approval for the expansion of the mine from a group of Kokatha elders who are being dragged into a meeting on December 14, 2008. However, there is some resistance from within this group. One source reports that some of the elders are not only reluctant to sign, but want to withdraw signatures already obtained from now deceased elders. BHP is confident that even one signature will suffice to provide evidence of consultation and consent.

As a result, from border institutions' perspective, the *Indenture Ratification Act* (1982) allowing BHP OD and its predecessor WMC to consult with whichever Aboriginal group in whatever way it prefers, is seen as fundamentally unjust.

Border institutions consequently establish another hierarchy and social order differing from those from market and hierarchy institutions. Border institutions construct the issue of justice and fairness with regard to the interaction between humans and nature and social relations. They contend that human fate is inextricably connected to that of Planet Earth (Ney & Thompson, 2011).

To conclude the rhetorical analysis, border institutions favour voluntaristic and egalitarian life-styles (Thompson et al., 1990, p. 62). They believe that the depletion of the GAB water resource is a result of an inegalitarian social system (Thompson et al., 1990), an example of which is manifested through BHP OD's unfair and undemocratic consultation with Aboriginal community, permitted under the *Indenture Ratification Act* (1982). Such unjust and unequal legal privileges have also allowed BHP OD a potential commercial gain over other miners and developers. Border institutions urge the South Australian government to adopt policies to prevent

"exploitative value" and "dehumanised relationships" (Douglas & Wildavsky, 1982, p. 135) such as charging and eventually phasing out BHP OD's GAB water extraction to protect the GAB water resource and related communities.

9.3.3 Logological analysis - Properties of desired systems of border institutions

The paradoxes and controversies inherent in the hierarchising and separating effects derived from properties of market and hierarchy (centre) institutions' desired system provide opportunities for border institutions to resist and transform. Through the construction of an inequitable system as the cause of ecological crisis and identification of justice and fairness as equality of conditions, border institutions establish 'social and environmental equity' as the terministic screen with respect to properties of their desired system to legitimate their preferred social order.

Border institutions believe that environmental pollution does not only occur in a physical and technical sense (Douglas & Wildavsky, 1982). According to Douglas and Wildavsky (1982, p. 37), there are conceptual dualisms upheld by the pollution ideal such as moral and immoral, purity and impurity, innocent and guilty as a means to "sustain the vision of good society". In this case, border institutions hold that the current and proposed intake of GAB water by BHP OD "may preclude other users by [sic] humans and the rest of the fragile ecosystems in those area for thousands and thousands of years" (Walsh T, CL 353, n. p.) (more details see Chapter 7, 8). They identify institutional mistrust and label GAB water degradation as a sign of the "moral defect" of the centre institutions (Douglas & Wildavsky, 1982, p. 36).

This moral defect is manifest in the form of the *Indenture Act* (1982) between BHP (and its predecessor WMC) and the South Australian government as a legal framework for operation and development of Olympic Dam (see Chapter 8, Section 8.2.2). According to the Environment Centre NT (CL 35, n.p. see also Walker N, CL 352), this *Indenture Ratification Act* (1982) "allows wide-ranging and totally indefensible exemptions from key laws" including the Environmental Protection Act (1993), the Natural Resources Management Act (2004) and Aboriginal Heritage Act (1988). As Hon. M. Parnell (Australian Greens, 2007, n. p.) indicates, the *Indenture Act* "was created to fast-track and protect the establishment and operation of the Olympic Dam copper and uranium mine."

From the border institutions' perspective, these "legal privileges" (Australian Conservation Foundation, CL 10, p. 3) are of a "sweeping nature" (Poppins, 2008, n.p.). For example, BHP OD's GAB water intake is exempt from the regulations of either the Environmental Protection Act or the Natural Resources Management Act. Two special water licences (*Roxby Downs (Indenture Ratification) Act* 1982) are "issued under this indenture allowing WMC [and its successor BHP OD] to extract groundwater from the borefields up to agreed maximum drawdown levels" (Keane, 1997, p. 42) (more details see Chapter 8, Section 8.2.2).

For border institutions, the first unfair legal privilege is BHP OP's "free consumption of water" (Rozali A, CL 309, n.p.). As Arid Lands Environment Centre (CL 8, n.p. ; see also Environment Centre NT, CL 35; Friends of the Earth, CL 42; People for Nuclear Disarmament (WA), CL 65; Roxstop Action, CL 77; Women's International League for Peace & Freedom (Australian Section), CL 92) contends:

> The Roxby Downs Indenture Act allows BHP Billiton to extract massive unsustainable amount of water for free, despite the company posting profits of [USD] $ 17.7 billion dollars in 2007-08 [USD $ 13.01 billion in 2010 and USD $23.951 billion in 2011 (Friends of the Earth, 2011)].

In Rozali A's (CL 309, n.p.) words, "[t]his is not fair dinkum". Although BHP claims that its bore-capping program has saved more water than the volume currently consumed by the mine (see Section 9.2.4), Friends of the Earth Australia (2011, p. 7; see also Friends of the Earth, CL 42) argue that:

> [w]ater extraction for the mine is localised and the adverse impacts are all too apparent to people who have monitored the Mound Springs over the past 20 years. Likewise, the company's bore capping program is small comfort to pastoralists who suffer reduced water flow from the localised effects of water extraction for the mine.

The second unfair legal privilege is BHP OD's exemption to any water restriction. According to Hon. M. Parnell (Australian Greens, 2007, n. p.);

> [w]hilst irrigators and householders are suffering water restrictions, BHP Billiton's arrangements provide that … there is no risk to the quantities it can take. This is directly against the National Water Initiative [NWI] which says that, when we need to reduce allocations, we need to share the pain of those cuts around. This particular corporate operation does not need to share any of the pain of water cuts to which irrigators and householders are subject.

> As such, the Indenture Act is considered as "unfair and undemocratic" (Henderson K, CL 196, n.p.).

For border institutions, 'worldliness' and 'conspiracy' have caused the environmental crisis that endangers humankind (Douglas & Wildavsky, 1982, p. 10).

> Put into secular terms, worldliness appears in big organization, big money, and market values - all deny equality and attack goodness and purity; conspiracy includes factions plotting secret attack, transporting evil into an essentially good world.

In this case, BHP OD's decision to undertake ODEP from the border institutions' perspective "has been justified on the basis of [economic] cost" regardless of the environmental cost (AAP General News Wire, 2011, n.p.; see also Friends of the Earth Australia, 2011; Whyalla News, 2011a). According to Organ K (CL 277, n.p.), for instance, the need for increased GAB water extraction for ODEP is:

> questionable and appears to be driven by extreme greed on the part of BHP B[illiton]. Should they continues to mine at Olympic Dam at their current volumes they will no doubt still make billions of dollars over a longer and more controlled period with no need to unnecessarily upgrade their water usage. It would seem to us that the unseemly haste with which BHP B[illiton] wishes to garner the riches of Olympic Dam verges on the obscene.

For border institutions, the *Indenture Ratification Act* (1982) is "the subject of secret negotiations between the South Australian government and BHP B[illiton]" (Environment Tasmania Inc., CL 37, p. 4). The South Australian government's stipulation and sanction of these legal privileges (see ection 6 and section 9 of the *Indenture Ratification Act* (1982) and *Indenture Amendment* (2012)) "makes a ludicrous farce of any governments claim to be taking…conservation issues seriously" (Maizey P, CL 248, n.p.). As speculated by Lad A (CL 233, p. 3), the South Australian government may think "it is more important to have a bullish economy rather than a healthy environment. That a rapacious BHP Billiton…is better value than ecological sustainability".

This attitude towards environmental problems is also closely related to how the South Australian government treat Aboriginal groups in the society. According to Burdon (2006, n.p.), for example;

> [t]he inclusion of the Aboriginal Heritage Act 1988 (AHA) in the Indenture Act has significant consequences for issues of equality and questions how seriously

> our State Government treats indigenous rights and interests…Our Government is playing a dangerous balancing game with promises on one hand and contrary legislative action on the other.

As such, "[South Australian] parliament has exposed the yawning gap between the government's hyperbolic spin over the Roxby riches and the dark reality of this terrible deal" (Friends of the Earth Australia, 2011, n.p.). Border institutions therefore commit to bring equality to all humankind, and they have a particular philosophical underpinning to justify their idea. Such a guiding principle is a belief in "human goodness and the supreme value of the individual" (Douglas & Wildavsky, 1982, p. 177). Hence, border institutions' desired system demands that individuals begin as equal and finish as equal (Ney & Thompson, 2011).

In this case study, border institutions support charging for water use and the eventual phasing out of BHP OD's rights to extract water to protect the GAB and related communities. For example, border institutions suggest that the GAB groundwater resource is "a resource owned by the whole of Australia and its people" (Crowford H, CL 138, n.p.). BHP OD "should be made to pay for its extraction of water and be working towards phasing out its use of this precious and finite resource" (Arid Lands Environment Centre, CL 8, n.p.; see also Women's International League for Peace & Freedom (Australian Section), CL 92; Henderson K, CL 196; Blakey C, CL 116; Keyes S, CL 224).

To conclude the logological analysis, border institutions believe that the *Indenture Ratification Act* (1982) between BHP and the South Australian government as a legal framework for operation and development of Olympic Dam points to the "moral defect" of the socio-economic system of the centre institutions (Douglas & Wildavsky, 1982, p.36; Thompson & Rayner, 1998). Since border institutions believe in "human goodness and supreme value of the individuals" (Douglas & Wildavsky, 1982, p. 177), their desired system requires their individuals begin as equal and finish as equal (Ney & Thompson, 2011).

9.4 **Economic consequences**

Accounting and reporting practice and disclosure is said to provide information for decision-making to correct market asymmetries. However, due to an increasing awareness of accounting in its social and political context, such a practice is neither

recognised as objective, neutral nor a fair representation (Cortese et al., 2009; Fogarty et al., 1994; Zeff, 1978). In fact, it is influenced by "outside forces" (Zeff, 1978, p. 56) that "have sought to impose their definition of reality, and the consequences of it, upon society" (Hines, 1988, p. 260). Such consequences are termed "economic (and/or social) consequences" (Fogarty et al., 1994, p. 25; Zeff, 1978, p. 56). Economic consequences[60] can be understood as "the results of the reallocative outcomes" of a policy standard, and "form the central political outcome" (Fogarty et al., 1994, p. 25).

Government policies, in terms of calculative standards, normally have an income redistribution or/and resource allocation function therefore entail economic (or/and social) consequences. Unsurprisingly, it is the economic (or/and social) consequences arguments that are used by various constituents to push through their interests and values to influence income redistribution or/and resource allocation (Zeff, 1978). It is normally argued that a certain outcome of redistributed wealth or resources is that it could "impose restrictions or costs on some while conferring benefits to others" (Solomons, 1978, p. 89). As such, policy-makers are advised to take these "allegedly detrimental consequences" into consideration when deciding on policy rules or standards (Zeff, 1978, p. 56).

In this case, the debate over the NRM water levy is analysed by drawing on different institutional assumptions regarding the cause for the depletion of the GAB water resource, the pertinent issue of justice and fairness and the properties of a desired system. Cultural risk theory, by contrasting these distinctive assumptions from market, hierarchy and border institutions, provides a rationale to understand an economic consequences argument from the perspectives of managerial, administrative and moral accountability.

In the grammatical analysis, the SAALNRM Board, as the South Australian government agency, proposed to collect funds from the NRM water levy to cover water planning and management activities of the Federal government agency through the NWI. The GAB water resource, from the perspective of the hierarchy institutions,

[60] Economic consequences in accounting studies is defined as "impact of accounting reports on the decision-making behaviors of business, government, union, investors and creditors" (Zeff, 1978, p. 56).

is a common/public good which is perceived as necessary for the enhancement of both economic and social well-being of the nation (Barton, 2006; Pallot, 1992). Hierarchy institutions' objective is to preserve public goods so as to provide social and environmental benefits to the public in perpetuity (Barton, 1999). The water levy is used to restrict mining activities by realigning the private, social and environmental cost to remedy the problem of externalities (Barton, 1999), and prevent the detrimental effects of excessive economic activity (Thompson & Rayner, 1998).

According to rhetorical analysis, the SAALNRM Board proposes to increase the water levy on industrial users because of 'the capacity to pay' principle while exempting stock and domestic users. The rationale for such preferred resource allocation and wealth distribution is from the hierarchical belief that fair distribution in society is ranked by a need for solidarity and maintenance of the system (Ney & Thompson, 2011) by "sacrificing a few for the good of the whole" (Douglas & Wildavsky, 1982, p. 101).

It is important to note that hierarchy institutions take normative values such as humanity and ethics into consideration with their water levy proposal for the common/public good (Williams, 1992). According to Funnell (2003, p. 107), governments of Westminster traditions are said to be accountable to parliament and the people for "governing in the best interests of all citizens according to accepted conventions or legally prescribed processes". The hierarchy institutions' water levy proposal, therefore, incorporates a social value base influenced by social needs and perception of doing the right thing (Ball & Grubnic, 2007). From the logological analysis, since it is the "nobility"'s obligation to "make a conceited genuine effort to shelter those at the bottom from the vagaries of life" (Ney & Thompson, 2011, p. 66), the SAALNRM Board proposes to increase the water levy on industrial users to assist the vulnerable stock and domestic sectors. This proposed water levy policy will redistribute or reallocate a part of the wealth from mining industry for the management of GAB. Hierarchical risk assumptions of the cause of ecological crisis, view of justice and fairness and properties of desired system therefore legitimate the SAALNRM Board's water levy charging rules/policy.

In grammatical analysis, to respond to the ACCC and the SAALNRM Board's plan to raise more funds for water planning and management activities, the MCA and the BHP OD as market institutions perceive this proposed government policy as "much ado about nothing" (Ney & Thompson, 2011, p. 47). It is because market institutions do not take into account the existence of social and environmental costs (Freedman & Stagliano, 1990; Lehman, 1996), and restrict social relations to economic terms (Messner, 2009; Roberts, 1991). In this case, the MCA views the increased water levy proposal on industrial users as inaccurate and a misguided economic policy which serves as a major "obstacle" to sustainable development (Thompson & Rayner, 1998, p. 299). It argues that the minerals industry is a small and responsible water user who has already borne the costs of water planning and management activities through the States' regulatory instruments and voluntary initiatives. From a market institution perspective, this 'unequal' water levy would bring disastrous economic and social consequences, as it is considered as a "disincentive" (Thompson & Rayner, 1998, p. 299) to efficient water-using behaviour. Evidently, market institutions portray humans as economic subjects pursuing self-interests through motivations and rationales such as individualism, utilitarianism and instrumental value of good (Arrington & Francis, 1993; Messner, 2009; Roberts, 1991; Shearer, 2002). This identity is characterised by a laissez-faire attitude that emphasises individual autonomy and the resultant freedom with respect to their needs and wants (Ney & Thompson, 2011; Schwarz & Thompson, 1990).

As such, the MCA advocates an equal water levy for all water users to support the objectives of a competitive and economically efficient market (Ney & Thompson, 2011). The intended economic consequence, arising from such an equal water levy, is that the mining industry is not requested to cover the cost of water planning and management activities for those from less productive water using sectors such as stock and domestic users. According to the logological analysis, the underlying rationale for this market institutions' preferred wealth distribution, or resource allocation, arises from the market institutions' faith in a 'free market' and the fittest survive principle (Douglas & Wildavsky, 1982; Hines, 1989).

As explained by Hines (1989), when markets are implicitly assumed to be occurring naturally, the demand-supply-price mechanism is considered as objective and value

free. Financial accounting and reporting practices, from this perspective, communicate the cost and price as emerging from this "impersonal" mechanism (Hines, 1989, p. 62). Following this argument, any government intervention in the free market play is considered as "unwarranted" unless such an intervention is consistent with the principle of an efficient market (Hines, 1989, p. 62). Moreover, it is assumed the most 'efficient' or 'fittest' firms are the "most profitable in financial accounting terms" since markets are arbitrated by an 'invisible hand' of market forces in terms of free competition (Hines, 1989, p. 64).

It is important to note that these are positive assumptions that market institutions take into consideration in their equal water levy proposal. The hierarchical suggestion of "nobility"'s obligation (Ney & Thompson, 2011, p. 66) and the need for free market control (Ney & Thompson, 2011), from market institutions' perspective, if incorporated, could hinder the development of a competitive and free market, and therefore should be excluded. It is notable here that market institutions assume common/public goods as the outcome of the free exchange that can be achieved by the pursuit of private interests (Benston, 1982). The issue that the interest of shareholders does not necessarily serve the collective or common good of the wider community is not visible (Shearer, 2002).

Therefore, these 'positivist' assumptions affect mainstream accounting's "ability to ask ethical questions about itself…by depriving its language of ethical meaning" (Williams, 1992, p. 104). Mainstream accounting practices, when considered as neutral and value-free, measure "efficiency", "productivity" and "profitability" and only these properties are considered as "real" (Hines, 1989, p. 65). Others, such as GAB water conservation, the equal right to access of water, and a strongly bonded democratic society, are given little or no recognition and therefore are not realised. According to Schweiker (1993) and Shearer (2002), this managerial accountability serves to negate the very obligation to broader social and environmental distributive justice, as it does not account for costs beyond a monetary value. Market institutions are loathe to accommodate the proposed water levy from hierarchy institutions and take responsibility for other individual failures (Douglas & Wildavsky, 1982) such as covering the cost of water planning and management activities for those from less productive water using sectors.

It is notable that in this case, the market and hierarchy institutions are divided on this issue, which provides an opportunity for the border to gain traction for influencing the decision-making of the centre. Border institutions, according to the grammatical analysis, believe that BHP OD's current free GAB water intake for its mining operation is a symptom of a wider social ill and imbalance (Ney & Thompson, 2011). This social imbalance is manifested through legal exemptions that are granted to BHP OD under the *Indenture Act* (1982). This moral defect arises from the alignment of managerial accountability and administrative accountability. From a border institutions' perspective, while managerial accountability has an overriding focus on the individual and profitability (Schweiker, 1993; Shearer, 2002), administrative accountability is vested in agreed procedures and rules supported by regulatory coercion (Puxty et al., 1987) which is concerned with political pragmatism and acceptance more than social and environmental equity and justice (Tinker et al., 1991).

Such a moral defect has brought: detrimental social and environmental consequences in terms of BHP OD's unfair and undemocratic consultation with Aboriginal groups; BHP OD's unjust and unequal legal privileges over other miners and developers; and, the depletion of the GAB water resource. From the border institutions' perspective, managerial accountability at large, and administrative accountability to some extent, reflect "a sense of self as solidary and singular with no necessary connection to others" (Roberts, 1991, p. 358). They are unlikely to rectify social ills fundamentally caused by "waste, exploitation, extravagance, disadvantage or coercion" (Tinker et al., 1991, p. 29). In the rhetorical analysis, it was shown that the allocation of the GAB water resource in favour of market and government short-term economic interests which has been arranged under the *Indenture Act* (1982) will never resolve the GAB water-related environmental problems unless the social ill in terms of humanity and equality are addressed (Ney & Thompson, 2011; Thompson et al., 1990).

Border institutions therefore call for the relinquishment of the legal exemptions for BHP OD under the *Indenture Act* (1982) for ODEP. More specifically, border institutions urge the South Australian government to charge and eventually phase out BHP OD's GAB water extraction. Resource allocation and wealth distribution,

preferred by border institutions, are to relieve and eventually resolve the GAB water crisis through "a levelling of the fundamental inequity" (Ney & Thompson, 2011, p. 37) between BHP OD and the Aboriginal community and between BHP OD and other miners and developers. The rationale underpinning such intended economic (social and environmental) consequences is from the sectarian bias towards a voluntaristic and egalitarian life-style (Thompson et al., 1990, p. 62) without "exploitative value" and "dehumanised relationships" (Douglas & Wildavsky, 1982, p. 135).

Border institutions as such hold a wider concept of accountability. This form of accountability can be termed 'moral accountability' which is a fundamental and more encompassing form of accountability to cover the ethical requirement of accountability to the other (Messner, 2009; Shearer, 2002). As Robert's (1991, p. 358) asserts, moral accountability can enact "a sense of self which whilst individually confirming simultaneously acknowledges and expresses the interdependence of self and others".

According to the logological analysis, it is this "moral defect" (Douglas & Wildavsky, 1982, p. 36) of the capitalist social order within which mainstream accounting practices are embedded that fails to challenge the root cause of environmental problems (Beder, 1997; Gray, 1992; Jones, 2010). From the border institutions' perspective, managerial and administrative accountability from centre institution is "a self-referential exercise" (Shearer, 2002, p. 559) which justify one's actions for one's own sake (Messner, 2009) and constructs social relations in a way that the moral obligation to others tend to be diminished if not silenced (Shearer, 2002).

Border institutions' proposed water charge and eventual aim of phasing out BHP OD's GAB water extraction, will first redistribute or reallocate part of the wealth from the mining industry for GAB water management, then relocate the GAB water resource to Aboriginal people, other miners and developers. As such, border institutions' risk assumptions of the cause of ecological crisis and justice and fairness legitimate their preferred water levy charging policy and eventual aim of phasing out BHP OD's GAB water use.

This proposed policy incorporates a (more radical) ethical dimension, as it is the "human goodness and the supreme value of the individual" that border institutions advocate (Douglas & Wildavsky, 1982, p. 177), in their attempt to "avert disaster to humanity" for restoration of a democratic society (Hines, 1989, p. 65). Moral accountability therefore, requires an identity answerable to wider social interests and it encompasses wider scope of common/public good, apart from the private good (Schweiker, 1993).

According to Solomons (1983, p. 108), the desirability of public policy "can only be evaluated in a normative model with a full set of assumptions". More specifically, economic consequences arguments arising from the proposed policy or standard are often based on certain assumptions including a posited criteria of what counts as goodness (Solomons, 1983). Cultural risk theory, by suggesting assumptions such as the cause of ecological crisis, view of justice and fairness and properties of desired system are shaped by institutional beliefs and interests, provides us with a critical lens to analyse the water levy debate with its related economic (and social) consequences arguments, and the further implications for accounting practices. In this theme, the market institution - the MCA and BHP OD's assumptions of the cause of ecological crisis, view of justice and fairness and properties of desired system have conferred institutional legitimacy on the positive economic consequences arguments for an equal water levy. Hierarchy institutions - the ACCC and the SAALNRM Board and sectarians from border institutions, by challenging those taken-for granted assumptions, albeit to a different extent, provide us with the opportunity to reconsider the 'positive' economic (and social) consequences and its implication for mainstream accounting to perpetuate ecological degradation and social inequity.

9.5 **Summary**

This chapter analysed the institutional debate of the GAB water risk through contested disclosures among market institutions - BHP and BHP OD, hierarchy institutions - Australian Federal and South Australian governments and border institutions - civil society, using three major concepts from cultural risk theory, with the application of Burkean rhetorical criticism. From this analysis, different institutional perspectives with respect to the cause of the GAB water sustainability

related risk, view of justice and fairness, and property of desired system and their implications for accounting concept of economic consequences and related accountability were described and discussed. This chapter also provided insights to facilitate and justify government intervention in financial accounting and reporting practices in the era of looming environmental crisis. These different institutional positions in the GAB water risk debate drives different concepts of value presented in the concluding chapter.

CHAPTER 10 CONCLUSION

This thesis investigates the contested domains concerning Great Artesian Basin (GAB) water governance and GAB water risks from BHP Billiton Olympic Dam Corporation Pty Ltd (BHP OD)'s mining operation. It examines the culturally constructed meanings of GAB risk by collating and analysing accounts and juxtaposing three sets of risk perspectives from industry, government and civil society. These different perspectives are manifested through mandatory and voluntary water accounting disclosures and policy debates from BHP, BHP OD, and its representative Minerals Council of Australia (MCA); the GAB water regulatory policy and proposals from the Australian Federal government and South Australian government; and alternative disclosures from civil society including Non-Government Organisations (NGOs) (radical), environmentalists and Aboriginal groups.

The context of this study is salient as it is concerned with the politicised control of the Australia's largest groundwater resource-the GAB against the backdrop of water scarcity and the complex nature of the water governance issue. Such complexity, according to James et al. (2012) is a result of how water is perceived and valued by different socio-cultural institutions. This thesis explored the procedural, techno-scientific and economic rationality of the industry and government and contrasted this with the social and environmental concerns from civil society to address the following question:

How do disclosures of perceived risk impact on assumptions of accounting and accountability provided by industry, government and civil society in the case of contested water sustainability of the GAB?

This thesis delved into the fraught terrain of accounting and associated issues of accountability. It conceives mainstream accounting as an authoritative and monologic discourse through which power is exercised and capitalist assumptions are imposed (Brown, 2009). Giving voice to alternative views and interests from socio-political constituencies other than those from industry and sometimes the government, this thesis aligns with a stream of 'counter-accounting' studies (Archel et al., 2009; Boyce, 2000; Gallhofer et al., 2006; O'Sullivan & O'Dwyer, 2009) to

highlight the political struggles and social conflicts inscribed within the fundamental contradiction and exploitative dimensions of capitalist system.

This thesis adopted a cultural risk perspective as a methodology which emphasises risk discourse from a social constructivist aspect and perceives the recognition and assessment of risk as an inherent socio-political activity infused with the (re)production of shared meaning and understanding of reality (Horlick-Jones & Sime, 2004). According to Head (2010, p. 10), contemporary water governance policies tend to be dominated by managerial efficiency and bureaucratic and authoritative procedures. These decontextualised and reductionist approaches in discipline-based risk research are found to be insufficient to understand the entire risk profile related to water resource issues (Baleta, 2012; Horlick-Jones & Sime, 2004). A cultural risk perspective perceives risk as transdisciplinary, culturally nuanced, and focuses on the institutionally constructed nature of the conceptual debate on risk and sustainability issues (Lupton, 1999). It facilitates a dialogic and participatory approach to the GAB water governance to promote transparency and democracy.

Consistent with a social constructivist methodology, the analysis used an approach that uncovered contradictions and gaps between corporate perspectives and stakeholders' perspectives. Burkean rhetorical criticism was adopted as a mode of inquiry. Consisting of a three levelled approach - the grammar, rhetoric and logology analysis - Burkean rhetorical criticism (Stillar, 1998) identifies and interprets features, functions and implications of discursive practices or discourses. It is based on the underlying assumption that rhetoric is one of the symbols to constitute the world to influence others to achieve social unity (Burke, 1950, 1966, 1969). This thesis examined how rhetoric is used by BHP, BHP OD, the Australian Federal and South Australian government and civil society through contested accountability disclosures.

To advance social and environmental approaches to accounting, this thesis was informed by a cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) that defines problems from three heterogeneous institutions - market, hierarchy and

border institutions. Applying Burkean rhetoric criticism with cultural risk theory informed the major sustainability related assumptions of the three institutions.

In Chapter 7, the three major concepts from cultural risk theory-preferred learning style (grammatical analysis for discursive features), view of nature (rhetorical analysis for discursive functions) and property of knowledge ideal (logological analysis for discursive implications) were used to analyse market - BHP and BHP OD, hierarchy - Australian Federal and South Australian governments and border institutions' - civil societies' perspectives manifest in their discourse in the context of GAB water-related risks. This three-level analysis had implications for an understanding of the accounting concept of control regarding natural resources from both mainstream and critical perspectives. In the grammatical analysis, centre (market and hierarchy) institutions trust expert knowledge and use scientific research to understand the rechargeability of the GAB, determine its water balance and implement modelling studies subject to evolving learning process. On the other hand, border institutions believe that the centre institutions' assumption of rechargeability is flawed and BHP OD's modelling studies are faulty due to simplistic models and limited data. These different assumptions about a preferred learning style underpin mainstream and critical perspectives of the accounting concept of control of water resources. In this case, market institutions believe that GAB water extraction does not entail a 'liability' as the potential risk for water extraction is uncertain. This perspective is sanctioned by hierarchy institutions - the South Australian government. Border institutions - civil society, on the other hand, contend that BHP OD has responsibility for environmental damage, such as declined spring flow.

In the rhetorical analysis, centre institutions believe that the current GAB water extraction from BHP OD is within 'sustainable yield'. Border institutions believe that GAB is a fragile and non-rechargeable water resource. These different assumptions, regarding the view of nature, give rise to an understanding of the accounting concept of control. In this case, the market institutions - BHP and BHP OD do not recognise the GAB water intake for BHP OD's mining operation as an asset in the financial report because a hierarchy institution - South Australian government grants it the water licence without charge. This 'asset' is unmeasurable therefore unidentifiable in monetary terms. Border institutions, on the other hand,

insist on the recognition and presentation of the obligation that BHP OD has towards the GAB water extraction related risk.

In the logological analysis, centre institutions silence contradictory scientific studies about the likelihood of the non-rechargeability of the GAB and ignore the moral and ethical dimensions to achieve procedural validity and the objectivity underlying a scientific method. Border institutions assert that the centre institutions' knowledge ideal is limited and incomplete and unethical due to the wilful ignorance of counter scientific inquiries in the pursuit of economic self-interest. In this case, the centre supports an accounting system which serves to overuse non-renewable resources by downplaying ecological impacts. Border institutions, on the other hand, support recognition of GAB water extraction related risks as a (contingent) liability to be recognised in BHP OD's financial reports and mandated by South Australian government.

This analysis revealed different styles of accountability perceived by three institutions. Market and hierarchy institutions use managerial and administrative accountability that focuses on the techno-scientific dimensions of accountability that neglects the full social and environmental cost of water use. Border institutions, in contrast, adopt moral accountability and acknowledge a relationship of obligation to the other which cannot be discharged by mere reference to scientific reasoning and economic interest.

In Chapter 8 the three major concepts from cultural risk theory-attitude towards technology (grammatical analysis for discursive features), view of risk (rhetorical analysis for discursive functions) and resolution of risk (logological analysis for discursive implications) were used to understand the accounting concept of stewardship.

In the grammatical analysis, while centre institutions construct and objectify GAB water risks through water-efficiency technology to control the uncertainty of water sustainability, border institutions believe that water efficiency related technology focuses on techno-economic facets, neglecting the moral and environmental dimensions of the GAB water risks. In this case, water efficiency related technologies are perceived by centre institutions as those having responsibility or

stewardship discharging function in respect of their financial, social and environmental responsibility. Border institutions, on the other hand, believe that a technological solution does not satisfy the discharge of environmental responsibility.

In the rhetorical analysis, centre institutions possess dual objectives of economic growth and water protection with the intention of turning risks into opportunities. Border institutions believe that the risk to the ecosystem from BHP OD's mining operation is irreversible. In this case, centre institutions believe that the general fulfilment of managerial stewardship is reflected in the South Australian government and BHP OD's objectives for both mining development and GAB water conservation. Border institutions, on the other hand, assert that the South Australian government's water governance regime and BHP OD's water efficiency program will not fulfil managerial stewardship regarding environmental responsibility unless radical change occurs.

In the logological analysis, centre institutions have imperialist tendencies and see the Olympic Dam Expansion Project (ODEP) as the best operational solution to sustainable development in general by excluding the long-term value and risks from their risk resolution. Border institutions, in contrast, do not construct economic expansion as an environmental solution. From their perspective, the ODEP in general and the water efficiency related technology in particular imply the promise of the satisfaction of endless wants for capitalist interests without satisfying real human needs. In this case, the continuous improvement of the water efficiency indicator legitimates managerial stewardship of BHP OD for its extant mining operation and the proposed ODEP. Centre institutions treat the social and environmental aspects as less important. Border institutions, on the other hand, believe that social and environmental responsibility can only be discharged by ceasing GAB water intake to recover earlier damage and depletion..

This three level analysis revealed different styles of accountability assumed by the three institutions. Market and hierarchy institutions assume managerial and administrative accountability that focuses on procedural and technical dimensions of accountability by treating GAB water reserves as an economic good and objectifying it for efficiency and profit maximisation. Border institutions, on the contrary, adopt

moral accountability that requires acknowledgement of relations to others which necessitates mutual understanding and political participation.

In Chapter 9, the three major concepts from cultural risk theory - the cause of ecological crisis (grammatical analysis for discursive features), view of justice and fairness (rhetorical analysis for discursive functions), and properties of desired system (logological analysis for discursive implications) was used to understand the accounting concept of 'economic consequences'.

In the grammatical analysis, hierarchy institutions plan and organise water planning and management activities to control market forces and prevent water resource degradation, such as the NRM water levy to fund activities. Market institutions perceive this proposed water levy as an inaccurate and misguided economic policy serving as a major obstacle to ongoing sustainable development. Border institutions, on the other hand, believe that the free and over extraction of the GAB for mining operations is a symptom of a wider social imbalance. The allocation of the GAB water resource in favour of market and government short-term economic interests reflects wider social issues in terms of humanity and equality. The water levy proposed by hierarchy institutions to restrict mining activities by realigning private, social and environmental costs to remedy the problem of externalities, is perceived by the market as 'unequal' and will bring disastrous economic and social consequences, since it is a 'disincentive' to efficient water use. Border institutions, on the other hand, assert that the wider social ills and imbalance manifested through legal exemptions granted to BHP OD brings detrimental social and environmental consequences.

In the rhetorical analysis, hierarchy institutions believe a fair distribution is reinforced by the need for solidarity and maintenance of the system. A water levy is proposed on industrial users because of 'the capacity to pay' principle. Market institutions believe that fair play resides in an unfettered market. Subsequently, the mining industry should not be required to pay the proposed water levy due to its investment in water planning and management services through regulatory and voluntary initiatives. Border institutions, on the other hand, favour a voluntaristic and egalitarian approach. They believe that the current inegalitarian social system is

manifest in the unjust and unequal legal privilege that BHP OD is entitled. Further, this 'dehumanised' relationship needs to be phased out to protect the GAB water resource and related communities. These different assumptions of justice and fairness give rise to the accounting concept of economic consequences. In this case, while hierarchy institutions take normative values such as humanity and ethics into consideration in its proposal of an unequal water levy for the common/public good, market institutions take positive assumptions into account for an equal water levy proposal and assume the common/public good as the outcome of the free exchange that can be achieved by the pursuit of private interests. Border institutions, on the other hand, incorporate (more radical) ethical dimensions into account.

In the logological analysis, hierarchy institutions believe in the impossibility and unnecessity of social equity and attempt to collect more water levy on sectors responsible for economic value creation and reward sectors with less economic success. Market institutions have a firm faith in a competitive free market and the survival of the fittest principle. Therefore, they do not want to take responsibility for cost recovery failure from those less productive water using sectors. Border institutions, on the other hand, contend that the legal framework for the operation and development of ODEP points to a 'moral defect' of the socio-economic system.

In terms of economic consequences, hierarchy institutions propose an 'unequal' water levy to redistribute or reallocate a part of the wealth from the mining industry to assist the vulnerable stock and domestic sectors in order to satisfy social needs and a perception of doing the right thing. Market institutions advocate an equal water levy to support the objectives of a competitive and economically efficient market. Border institutions, on the other hand, urge charging a levy and eventual phase out of BHP OD's GAB water extraction for resource reallocation and wealth redistribution for restoration of a democratic society.

This three level analysis revealed different styles of accountability. Hierarchy institutions assume administrative accountability, which is vested in agreed procedures and rules supported by regulatory coercion. Market institutions assume managerial accountability which restricts social relations to economic terms and portrays human identify as purely economic subjects pursuing self-interests. Border

institutions, in contrast, assume a moral accountability which is a fundamental and more encompassing form of accountability requiring an identification of the social interest and a wider definition of common/public good.

10.1 Contribution to the accounting literature

This thesis addresses GAB water governance from different socio-cultural institutions and the discursive significance of contested accounting and alternative (counter-accounting) disclosures involved in the GAB water debate arising from the BHP OD's mining operation and the proposed expansion.

Ideological splits in respect of risk-based sustainability issues between divergent interest groups has been keenly acknowledged by critical accounting researchers (e.g. Brown & Dillard, 2013; Dey et al., 2011; Dillard & Brown, 2012; Spence et al., 2010). Although the current critical SEAR studies have identified that the modern corporate water accounting and reporting practices represent capitalist interest perpetuating the status-quo, there is a lack of water accounting studies that explicitly highlight the political struggles and social conflicts by including socio-political constituencies, other than those from the industry. In other words, the current literature on water related SEAR -practices tends to be organisational or industry-focused without engaging with the construction of social and environmental values and positions from other perspectives, such as those from NGOs, environmental activists and Aboriginal groups. As Spence et al., (2010) contend, this apolitical problem of SEAR research undermines both its theoretical and practical agenda for social change.

This thesis echoes this call and examines how BHP, BHP OD, Australian Federal and South Australian governments and civil society perceive 'sustainable' water governance in general and BHP OD's entitlement to and management of the GAB water in particular. It compares water accounting disclosures in the form of mandatory and voluntary social and environmental reporting and policy debates from industry, water regulation related disclosures from governments and juxtaposing them with external alternative accounting disclosure from civil society. It is therefore aligned with counter-accounting studies which give voice to alternative views and interests and expose the fundamental contradictions and exploitative dimensions of a

capitalist system (e.g. Archel et al., 2009; Gallhofer et al., 2006).This thesis further interrogates three different styles of accountability (stewardship) and their corresponding underlying value schemes through the lens of water related accounting and alternative (counter-accounting) disclosures. Its makes a unique contribution to the extant literature by adopting a discursive and dialogical approach to accounting to create social and environmental visibilities, promote democratic participation, enhance transparency in decision-making and improve accountability (Bebbington et al., 2007; Brown, 2009; Brown & Fraser, 2006; Dillard & Brown, 2012; Gray, 1992).

10.2 Contribution to methodology and method

As Brown and Dillard (2013) propose, there is a need for a more inclusive consideration of and approach to accounting to confront the prevalent power asymmetries to surface and support heterodox view, voices, visions and values from various interest groups. The methodology of a cultural risk perspective is a transdisciplinary approach encompassing multiple worldviews to constructing knowledge (Brown et al., 2010).

Extant water accounting studies anchor managerial and economic accountability discourses through corporate disclosure mechanisms including mandatory and voluntary sustainability type reports. These approaches tend to be organisation-centred rather than issue-centred, disciplinary rather than transdisciplinary, ontological homogenous rather than diverse. They downplay institutional and social dissents and conflicts (Brown & Dillard, 2013). By combining elements of various methodologies from both positive and normative risk disciplines in a single approach, a cultural risk perspective is used in this thesis to investigate ecological issues to "develop and implement pluralistic democratic processes that can help articulate and operationalize a progressive social and environmental agenda" (Brown & Dillard, 2013, p. 9). This evolved transdisciplinary methodology therefore brings 'hard' (positive and objective) and 'soft' (normative and judgemental) knowledge together which "transcends 'pure' discipline" (Horlick-Jones & Sime, 2004, p. 444), and seeks to deliver and enhance public participation and engagement in water resource policy decision-making against the backdrop of water scarcity and complex water governance in a democratic pluralist society.

Accounting information in this thesis is conceived as discursive and rhetorical components of a dialogue (Frame & Brown, 2008). As Fairclough (2003, p. 3) contends, discourse is referred to as "different ways of structuring areas of knowledge and social practice". In this thesis, discourse is considered as a mode of institutional and political practice. Consistent with a cultural risk perspective as methodology, both complementary and competing discourses emanate out of interactions between BHP OD, governments and civil society around the water intake of BHP OD for ODEP. These different sets of discourses are linked to different cultural and institutional risk perspectives in respect to the relationship individuals have to nature and their social relations.

Rhetoric is the strategic technique of using discourse for persuasive effects. This thesis examines the culturally and institutionally constructed nature of the GAB water related risks and how it is conducted through discourse in accounting and accountability related documents by adopting a Burkean rhetorical criticism as a method (Stillar, 1998). With a Burkean assumption that rhetoric is one symbol to constitute the world, gives it meaning and expresses common interests to achieve societal unity (Burke, 1950, 1966, 1969), this method incorporates three levels of analysis - grammar, rhetoric and logology (Stillar, 1998) to identify features, functions and implications of discourses. By apply this Burkean rhetorical criticism to cultural risk theory allowed the researcher to establish theoretical concepts (Chapter 6) and provide analytical scaffolding to facilitate interpretation of the GAB water risk debate by drawing on three institutional discursive risk practices.

10.3 **Contribution to theory**

This thesis adopts cultural risk theory as a transdisciplinary approach to theorise social conflicts and dissentions and their implications for wider social engagement and dialogue (Brown & Dillard, 2013; Spence et al., 2010; Tinker et al., 1991). By defining problems from heterogeneous domains (Lawrence, 2010), cultural risk theory explores the underlying assumptions of the contentious water related disclosure and accountability discourses which manifest as the GAB water debate.

Cultural risk theory (Douglas, 1970; Douglas & Wildavsky, 1982) perceives risk as social constructs determined by cultural rationalities and beliefs of various

institutions within society. Risk-based sustainability policies, from this perspective, result from a constant struggle among these participants to position their risk perspectives on the public agenda and impose it on others (Baleta, 2012). Cultural risk theory enables divergent interest groups, creates and enlarges institutional spaces of potentiality through which alternatives are facilitated to emerge/surface (Brown & Dillard, 2013). Accordingly, cultural risk theory is employed as a 'polylogic' theory to democratic engagement and participation with an emphasis on socio-cultural expectations and value debates (Brown & Dillard, 2013; Horlick-Jones & Sime, 2004; Sampford, 2009).This thesis contributes to cultural risk theory by applying a Burkean rhetorical criticism framework to tease out major risk-based sustainability assumptions of three (active) institutions - industry, government and civil society, associated with features, functions and implications of each institutional group's risk discourse. These assumptions to demonstrate the explanatory power of this theory for analysing contested discourses of the GAB water related disclosure from BHP OD, governments and civil society. These concepts which are made explicit in this thesis are preferred learning style (feature), view of nature (function), property of knowledge ideal (implication), attitude towards technology (feature), view of risk (function), resolution of risk (implication), cause of ecological crisis (feature), view of justice and fairness (function), and property of desired system (implication).

These nine concepts in turn have implications to three accounting and accountability related themes. Preferred learning style, view of nature and property of knowledge ideals from three institutions facilitate the understanding of the contested nature of accounting concept of control with associated accounting recognition and measurement rules. Institutional perceptions of attitude towards technology, view of risk and risk resolution assist an understanding of the stewardship debate from both mainstream and critical accounting perspectives. Institutional assumptions of the cause of ecological crisis, view of justice and fairness and property of desired system enable the analysis of the natured resource allocation debate with its related economic consequences arguments, and further implication for accounting practices.

This thesis also contributes to cultural risk theory by matching three different styles of accountability and their corresponding underlying concepts of value to market,

hierarchy and border institutions' risk-based sustainability assumptions. It explicates managerial, administrative and moral accountability to enable a further understanding of why certain risk discourse and rhetorical strategies are operated within centre - market and hierarchy institutions and why they are resisted and negotiated by those from border institutions with alternative accounting disclosures. Cultural risk theory (Douglas & Wildavsky, 1982), through the recognition of the existence of three (active) institutional solidarities, and the resultant cultural dialogues manifest in accounting and accountability discourse, is crucial for its significance in respect of the resolution of risk-based sustainability problems. This thesis underlines and fosters conflictual and oppositional social groups (Brown & Dillard, 2013). It seeks to engage heterodox socio-cultural perspectives, surface the inevitably dissenting assumptions and values associated with accounts, and highlight the power relations which structure dialogical opportunities. As such, understanding of accounting is broadened from the formal organisational or institutional-centred perspectives, to acknowledge the demand for democratic engagement between diverse actors across various political arenas (Brown & Dillard, 2013). Cultural risk theory therefore, helps 'resensitise' accounting to "its critical and pluralistic roots by advocating a version of pluralism that is less 'politically quiet'" (Brown & Dillard, 2013, p. 9).

10.4 **Thesis limitations**

The limitation of the thesis can be categorised into both scope and methodology. The discursive practices or discourses are analysed only through public available documents from three institutions - market (BHP, BHP OD, MCA); hierarchy (the Australian Federal Government and South Australian government); and border institutions (civil society). In this case, the analysis of stakeholders' interaction dynamics are confined to the nature of the documents collected and investigated for each institutional perspective; and, some stakeholder group perspectives (e.g. Fatalist solidarity) were excluded from the disclosure dynamics as a result of unavailability of data (Rodrigue, 2014). In addition, emphasising the disclosure production (account) and communication (rhetoric) has meant that the reception of the disclosure was beyond the scope of the thesis and research question.

While this study offers an in-depth understanding of micro-level information dynamics in the accounts, it restrains the generalisability of findings and conclusions (Rodrigue, 2014) from a broader context. This meso-level of analysis, is also incapable of addressing all the complexity and anomalies of pluralist and competing interests involved in the GAB water governance regarding BHP OD's water intake for its mining operation or the macro-level context such as global capital.

10.5 Future research

There are some potentially fruitful areas for future research arising from this thesis. The case of the GAB water debate arising from BHP OD's mining operation plays a pivotal role for understanding the water problems with contested water governance paradigms. To address the thesis limitation, other forms of discourse such as interviews could be conducted by the researcher with representatives from BHP, BHP OD, the Federal Australian government and South Australian government, the NGOs, radical environmentalists and Aboriginal groups.

Additionally, on a macro level, this approach together with cultural risk theory as a 'polylogic' framework can be applied to other political debates of water such as those from Great Artesian Basin Strategic Management Plan and the National Water Initiative (NWI) more broadly. On a meso or micro-level, it can be duplicated to other specific water dialogue or discussions for example coal seam gas mining in the Murray-Darling Basin.

Apart from the water context, there are also opportunities to research other types of environmental issues including air and soil pollution and how these issues are politicalised and negotiated by different socio-cultural institutions within society.

APPENDIX A An Example of differences between grammatical and rhetorical analysis

Stillar (1998) exemplifies differences between grammar and rhetoric through an illustration of texts on a 'Ancient Grains' cereal box.

TEXT 3.1
Ancient Grains cereal box.

Front panels
Made with organically grown ancient grains
"TOO GOOD TO BE TRUE"™
PC™
President's Choice™
ANCIENT GRAINS cereal

- Only 115 calories per serving
- Contains organically-grown ancient grains Spelt, Millet, Kamut and Quinoa
- 13.5 grams dietary fibre per serving
- No refined sugar added—sweetened with honey
- Only 2% calories from fat
- No preservatives added
- No artificial flavours or colours

Side panels
By supporting the use of these rare and ancient varieties of grains, you're encouraging the continued cultivation of these treasures from the past, which might otherwise be lost forever . . .

Spelt
dates back to biblical times and grows well without fertilizers, pesticides and insecticides. It's a versatile grain, perfect for baking, pastas and cereals.

Millet
is a hardy, small grained annual cereal grass believed to have originated thousands of years ago in central Asia. It has a pleasant nutty flavor.

Kamut
pronounced "Ka-moot"—commonly known as "King Tut's Wheat"—originated in the Near East and is believed to be an ancient relative of modern durum wheat. It has a rich, buttery flavor.

Quinoa
pronounced "Keen-wa"—was a staple of the Inca Empire and is appreciated for its delicious taste and fluffy texture.

Source: Stillar (1998, p.71)

'Too Good to be True" is the name for a series of low-calorie breakfast cereal manufactured by the President's Choice product line (Stillar, 1998).

There are two sections of text for the side panel. The first consists of a sentence stressing the importance of these grains, while the second makes a list of four types

of grains with a precise description with respect to their history. The first section (cereal manufacturer as agent) advocates the consumption of the cereal (the act) to preserve on-going cultivation (the purpose) (Stillar, 1998).

The second section characterises grains as agents that possess noteworthy attributes that derive from their ancient geographical origins. This scene constructs the grains as mysterious and powerful as a result of their origin and characteristics (Stillar, 1998).

These grammatical resources (act, purpose, agents, agency and scene) provide structures and features of symbolic action. The grammatical analysis is concerned with making replicable and explicit statements with regards to the use of combined language units and operates with a consistent and coherent set of terms to derive a descriptive analysis.

The grammar resources form a basis for a rhetorical act. Rhetorical analysis focuses on an overriding function of language as symbolic action. Identification here is dependent on consubstantiality - sharing substance, in literal and symbolic terms. This rhetorical act aims to persuade, invite and unite the reader to consume the cereal to become a part of Ancient Grains consumer congregation literally and a part of 'ancient' grains preserving congregation symbolically (Stillar, 1998).

The rhetorical act embedded in the text therefore seeks to build a unity of addressees sharing interest and having a stake in conservational-characterised hierarchical social order (those who consume 'ancient' grains and those who do not; those who are insiders and those who are outsiders; those who are up compared to those down). What is constituted as 'ancient' and 'exotic' in terms of history and culture is presumed to be superior to those contemporary and commonplace grains; and addressees those who 'connect' themselves with 'ancient' grains as presupposed to be more environmentally, culturally conscientious and health conscious than those who do not (Stillar, 1998).

Appendix B Balance Scorecard (BSC) Information Technology in BHP OD's Sustainable Water Management

BSC (target setting and development of performance drivers) is an information technique used in the GAB water management. In order to control any of the water variables, a "meaningful target" needs to be set. However, because of the complex nature of the interlinked unit operations and the special water quality needs for each unit, determining a meaningful target is not straightforward. Apart from that, there are also other difficulties of setting the target. For example, traditional metrics such as water consumption per day might be appropriate for a long-term planning, but it is not appropriate for shorter frame such as daily and weekly which is necessary for feedback regarding operation. In addition, the target setting can be complex for water use as relation between water usage and mineral production is not linear due to, for example, seasonal or emergency reasons (Torrisi & Trotta, 2009).

For such meaningful targets to be set, activities such as consulting with operational personnel, reviewing the instrumentation and process diagram, inspecting plant, measuring water flows manually and statistically analysing historical measured flows were conducted to understand water consumption drivers at Olympic Dam. The climate and production drivers are obtained for some 91 water consumption points across the operation and a model to predict the water consumption of each point was developed. Key water consumption drivers on a daily basis were found. They are flotation tailings thickener underflow density, mill throughput, copper concentrate produced from rotation, Smelter anode production, smelter feed rate, acid production, relative humidity and ambient temperature (Torrisi & Trotta, 2009).

The approach for setting targets is practical and time efficient. Instead of using theoretical principle for water consumption and identifying the basic demand for water by each operational unit, majority of targets were simply set on the basis of historical use excluding those from random events. It is believed that targets on historical data provide more realistic predictions. The application of various water consumption models to planned production on daily basis helps to calculate daily water targets for consumption in terms of individual streams. This allows collective targets for unit operations to be made. It also helps to forecast future water demand from "a strategic and budgeting perspective" (Torrisi & Trotta, 2009, p.198).

BSC (performance measures)

The GAB water use is metered at various locations to obtain the balance between overall extraction and operational and domestic (Roxby Down) usage. The volume of extracted water from all production bores at the wellfields and the volume delivered to BHP OD site were recorded by flow meters. The majority of them are magnetic tube meters and approximately 90 percent of GAB use is explainable using those meters (Torrisi & Trotta, 2009).

There is a daily water supply balance through which the daily water demand can be determined. Volume balancing for water supplied, water demanded and net storage changes is achieved using 'Production Balance by Honeywell' - a "specially designed and configured software"(Torrisi & Trotta, 2009, p.198). Data collection is almost automated and daily data are automatically retrieved through flow meters connected to "the Ethernet PLC process control system and attached data acquisition system". They are then totalised and fed into the Production Balance of the software. According to Torrisi and Trotta (2009, p.198), such information is "invaluable to the operations and management teams by allowing real time decision making to reduce operating costs by minimising the water demand by the unit operations."

BSC (water consumption and variance analysis)

According to Torrisi and Trotta (2009, p.199), data of water consumption are presented on BHP OD's intranet using database of Production Information Management System (PIMS) to track actual water usage against the target. Data are available for various time frames ranging from individual streams and site totals and expressed in both efficiency and volumetric basis. Traffic lights are used in the report to indicate whether the actual water consumption is above, below or close to the target. Such a report is discussed at integrated management meetings daily, weekly and monthly. Regarding analysing the variance, the water usage variance for operation of individual unit is analysed in integrated management reporting by volume variances and efficiency variances (more details see section 6.2.2) (Torrisi & Trotta, 2009).

BSC (rectification of variance)

According to Torrisi and Trotta (2009), improved operating discipline leads to the achievement in water use efficiency. Operating discipline is defined by Olympic Dam as "the adherence to operating procedures for the prevention and timely rectification of safety, environmental and production variance." Within Olympic Dam, many of unit operations are "ISO 9001 and ISO 14001 Quality systems certified with extensive controls in place to ensure compliance" (Torrisi & Trotta, 2009, p.202).

Torrisi and Trotta (2009) give an example of recycling water recovered from Smelter Concentrate Filtration to Grinding. There are occasions such as during a shutdown, the water cannot be accepted at Grinding and therefore must be disposed in the tailings storage facility. In this situation, water losses approximately equals to 2 ML/d. Such loss was quite frequent and often unnecessarily occurs because of poor planning, little operational discipline and a lack of communication between departments of production. Changes have been made to a situation where production departments work closely to ensure water is recycled and a plan for shutdowns. Moreover, some manual valves to divert the water to disposals are "locked closed to allow control over their operation" by the coordinator of the concentrator production. The disposal water is now "limited to an absolute last resort" (Torrisi & Trotta, 2009, p.203).

BSC (Learning + Development)

The BSC approach also incorporates an aspect of learning and development to facilitate improved water consumption efficiency. According to Torrisi and Trotta (2009, p.202), the accountability for sustainable GAB water management is maintained "throughout the organisation from the President Uranium through to Technicians who have hour to hour control of the water demanded by the operation". The position description of every employee demonstrates "responsibilities for achieving Zero Harm to the environment through the sustainable use of water in recognition of the supply from the GAB" (Torrisi & Trotta, 2009, p.202).

Water budgets are set for major operational sections (BHP Billiton Olympic Dam Corporation Pty Ltd., 2008b, p.7), and water issues including water demand are

discussed at production meetings on a daily and weekly basis. Key water consumption drivers are represented graphically for awareness and education purposes (Torrisi & Trotta, 2009). In order to align organisation behaviour to sustainable GAB water extraction and usage, water key performance indicators are included in BHP OD's Reward and Recognition Scheme. It includes a proportion of the reward for employees for achieving water efficiency targets quarterly and annually. To further reinforce appropriate water use behaviour by management and supervisory teams, water consumed by each production department is "internally priced and charged to the end user by the infrastructure Department". Such priced water encourages managers to "drive water efficiencies and hence lower reportable operating expenditure for their area" (Torrisi & Trotta, 2009, p.202). In addition, BHP OD also establishes a water steering committee "with representatives from all departments, to ensure a coordinated approach to…water management across site" (BHP Billiton Olympic Dam Corporation Pty Ltd., 2011b, p.2).

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